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DISCOVERY

A Monthly Popular Journal of Knowledge

December 1936 One Shilling

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(*Continued on page cix*)

DISCOVERY

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Notes of the Month.

The interest aroused by previous "area" numbers of Discovery, dealing principally with special quarters of the globe, has encouraged us to follow up the Australasian and Pacific Number and the later Tropical African Number with an issue devoted to Latin America. The subject appears a specially appropriate one for Discovery, as it is in the wilds of Central Brazil that the largest area of the earth's utilisable surface still remains to be explored; while in Mexico, Central America, and Peru are preserved the splendid relics of civilisations concerning which our knowledge is of the scantiest, though much material is available for examination and even more, perhaps, awaits the archæologists' attention. Moreover a topical interest likewise attaches to the Spanish-speaking part of the continent: the culture of Old Spain is threatened with extinction by a bloody civil war, and it may be the task of these New Spains overseas to carry on the torch of Hispanic civilisation.

* * * *

The twelfth annual Norman Lockyer Lecture of the British Science Guild, on *Science in Development* was delivered by Lord Rutherford in the course of last month. He took as his text the difficulty that faced the young investigator to-day in appreciating the great changes in laboratory technique and apparatus that have occurred within the lifetime of senior scientific workers. The progress of discovery had been much influenced by the development of new instruments and new methods of attack. In particular, he said, improvements in the methods of producing high vacua have had a great influence not only in pure Science but in Industry. The invention of the mercury pump led to many important discoveries, including the production and nature of the cathode rays, the discovery of X-rays and the methods of determining with accuracy the masses of swift charged atoms and molecules produced in the discharge tube. Modern electric lamps, valves, and rectifiers would not have been possible but for the development of methods of obtaining high vacua in sealed tubes, and a specially wonderful instrument was the diffusion pump which has now come into universal use both in Science and in Industry.

* * * *

Lord Rutherford gave illustrations of modern methods of producing high vacua in the making of lamps and valves on an industrial scale, and he reminded his hearers that the development of the vacuum electron tube, both as an oscillator and rectifier, had made possible those miracles of modern science, radio-telephony and broadcasting, while the cathode ray tube played an indispensable part in television.

* * * *

This lecture has a special interest quite apart from its intrinsic importance, as it is the first of the series to be delivered since the fusion of the British Science Guild with the British Association; and it is specially appropriate that the first lecture following this happy union should have been delivered by one of the world's most eminent men of science. Sir Norman Lockyer himself had always been anxious that the fusion should become possible; and the special attention now denoted by the British Association to subjects bearing on the relations between science and the welfare of the Community has enabled the possibility to become a fact. This year's Blackpool meeting of the British Association will always be memorable as the scene of the official fusion of the two bodies, an event that cannot fail to be of the greatest benefit to the cause of British Science. The Parliamentary Science Committee of the Guild continues to maintain a separate organisation,

A joint archæological expedition of the Peabody Museum and the Smithsonian Institution of Washington to Yucatan claims to have advanced an important stage towards the solution of the problem of the origin and early development of the culture of the Maya peoples of Central America, which American archæologists have been trying to solve without success for twenty years and more. Dr. W. D. Strong, who is in charge of the expedition, reports that he has found at a depth of twenty feet in a site on the Ulua River pottery fragments incised and painted with designs, which show a resemblance to those of early Mayan pottery. These designs, however, are simpler and painted in monochrome, instead of polychrome as is the early Mayan pottery. Overlying this culture was a band of sterile clay six and a half feet thick; and then came burials and pottery fragments typically Mayan. A connecting link is afforded by a neighbouring site on the Comayagua River, where the expedition found Mayan pottery of an early type, which seems to shade off into that of the earlier culture of the Ulua River. It would appear, therefore, as if this latter might be regarded as ancestral to the typically Mayan culture of the site.

* * * *

Recent official publications of interest and importance included a new addition to the Megalithic Survey of England and Wales and a third volume of the illustrated regional guides to Ancient Monuments under the care of the Office of Works. The former, the *Map of South Wales, showing the Distribution of Long Barrows and Megaliths*, is compiled by F. W. Grimes, and published by the Ordnance Survey Office at the price of 5*s*., 5*s*. 6*d*., or 6*s*. 6*d*. Attached to the map is a discussion of the area surveyed, of special interest in view of the importance of the district to the study of megalithic culture in Britain. The story of the South Welsh provenance of the "blue stones" at Stonehenge is now well known, but Mr. Grimes throws new light on the as yet unsolved problem of the route by which the stones were brought from the Pembrokeshire hills to Salisbury Plain.

* * * *

The new "Ancient Monuments" handbook, *England: East Anglia and Midlands* (H.M. Stationery Office. 1*s*.) is, like the previous two volumes, the work of Mr. Ormsby-Gore, though he himself has now passed on to another sphere of usefulness. Written with the clarity and brevity that we have now come to expect, the volume covers a wide area, from the Cotswolds to the Norfolk coast, and from the Tower of London to the Peak District and Chester, completing the survey of England and leaving Wales and Scotland for our future delectation. It contains details of the preservation of such unique monuments as the Eleanor Cross at Geddington and the excavations at Verulamium; and in these days when country houses of all types are falling into ruin all around us it is good news to read of the care given to what is left of famous mansions like Kirby Hall, Northants, and Houghton House, Bedfordshire.

* * * *

A pottery kiln, in which small domestic articles were made at least sixteen hundred years ago at the time of the Roman occupation of Britain, will be on view to the public at the Science Museum, South Kensington, from December 1st. The kiln, which was crudely constructed of clay, is in an almost perfect state and is the only one to be seen in this country. It was discovered under the soil in the middle of a ploughed farm field near Aldworth, Berkshire. Under the supervision of Mr. T. C. Crawhall, of the Science Museum, it was isolated from the surrounding chalk which had preserved it intact and, encased in reinforced concrete, was brought safely to London by road. In the Science Museum it is exhibited in a realistic representation of its original setting.

* * * *

In addition to a new group of attractive greeting cards for Christmas use, the British Museum authorities have just produced two more series of pictorial cards in colour, which some may well prefer to the more conventional type of illustrated Christmas token of goodwill. The new series consist of six reductions, excellently varied, of J. M. W. Turner's water-colours, and six reproductions, a little more than half the original size, of agricultural scenes from that mine of pictorial history, the Luttrell Psalter. On a more lavish scale is the folder containing a full-size reproduction of the "Travelling Coach for Royal Ladies" from the same illuminated MS., a masterpiece of 14th-century art, with its thin-legged heavily-shod horses, and its real fairy-tale queens, gold crowns and all, two of them engaged in attending to their pets. Rich aunts could not fail to be pleased with this really sumptuous card attached to their Christmas greetings. A. L. Richter's little-known water-colour, "Christmas Eve," also reproduced by the British Museum, is charming in the Hans Anderson vein, with its background of a distinctly Nordic Bethlehem, including a cat on the gable-ridge.

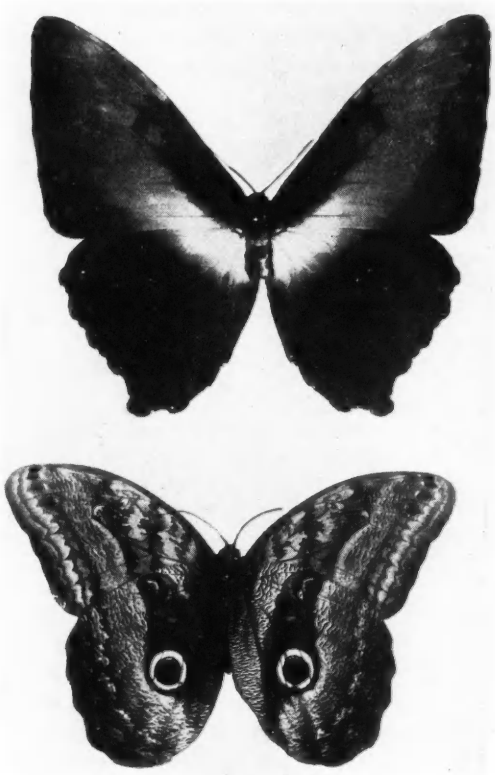
Tropical Butterflies of South America.

By T. Milford Cottam.

The remarkable size and brilliant colouring of the butterflies of the Amazon valley and its tributaries are well known; but the various types of mimicry and the gradation of varieties are less familiar. Major Cottam's article is a most interesting summary of the state of our present-day knowledge of the subject.

THERE is no part of the known world more rich in numbers and species of Diurnal Lepidoptera than Tropical America. The traveller-naturalist, H. W. Bates, collected over 1,200 species of butterflies in a country which is nowhere more than 500 feet above sea level. Since then many new species have been discovered, and it is highly probable that if ever the far interior of Brazil becomes opened up, still more new forms will be brought to light. Many others may be living in the valleys of the Andes.

Butterflies are most abundant in old and tolerably open roads and pathways through the forest; they are plentiful also in settlements where fruit trees and shrubbery offer suitable haunts. The damp sand at the margins of rivers and pools will attract certain species in vast numbers: these appear to be only males, the females remaining in the forest, where, towards the afternoon, they are joined by their male partners. Bates has described how the congregating hosts of sulphur, yellow, and orange *Catopsilias* resembled huge beds of crocuses.



Above: Morpho hecuba.
Below: Caligo zeuxippus.

The butterflies of the tropics, both in the eastern and western hemispheres, are very different from those inhabiting the more temperate zones. A considerable proportion of the species are large—a wing expanse of six to eight inches being not uncommon among the *Papilios* and *Morphos*, while, in New Guinea, the huge *Troides Alexandræ*, the female of which is the largest butterfly in the world, reaches as much as ten inches across the wings.

As the *Troides* or *Ornithoptera*, the magnificent bird-winged butterflies, are the glory of the eastern tropics, so the marvellous, metallic blue *Morphos* are eminently characteristic of Tropical America, there being nothing quite analogous to them in the warmer parts of the eastern hemisphere. Their great expanse of wing is accompanied by a slow flight, and, as they float through the air, at not too great a height from the ground, sometimes coming to rest with expanded wings, these noble insects appear even larger than they are in reality and present one of the most striking sights that the insect world can produce.

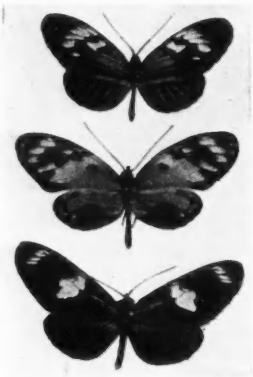
Of late years the males of some of the species, notably *M. menelaus* and *M. rhetenor*, have become familiar to many people by being largely used for the manufacture of the so-called "butterfly jewellery." The reason of the fadeless quality of this wonderful blue is that there is virtually no pigment whatever, the gorgeous metallic effect being produced by refracted light caught by a series of minute upright scales. Not all the *Morphos* are blue; some are grey-green, one is nearly white, and some are brown. Chief amongst the brown is the truly magnificent *M. hecuba*, "the sun butterfly," which has a wing expanse of nearly 9 inches. The underside of this butterfly is a rich fulvous brown, shaded with black and having numerous silvery bands and large ocelli or eye-spots. In the lower Amazon valley this butterfly is represented by a race known as *Cisseis*, in which the orange-brown of the upperside is replaced by a delicate blue. In the upper Amazon a variety known as *phanodemus* occurs, an essentially blue form in which, however, there is sometimes an admixture of the orange-brown of the true

hecuba. Dr. Hahnel bestowed upon this species the title of the "King of the Forests."

Some of the *Morphos*, such as *M. zephritis*, which inhabits a particularly unhealthy part of Peru, are exceedingly rare. The females, which are much rarer than the males, are often brown, but occasionally they assume male coloration. The late Mr. Joicey possessed a very fine blue female of *M. cypris*, perhaps the most brilliantly coloured insect in the world. In the Hunterian Museum of Glasgow University, there is a perfect gynandromorphic specimen—one side being male and the other female.

One of the most delicately beautiful of all the *Morphos* is *sulkowskyi* from Colombia: the wings of this butterfly are like lovely iridescent mother of pearl. This species was first exhibited at the Great Exhibition of 1851. In the illustration on page 335, will be found a magnificent male *M. hecuba* and also an underside of a male "Owl Butterfly," *Caligo zeuxippus*, caught by Mr. W. F. H. Rosenberg, who has kindly lent the specimens that are used to illustrate this article.

Caligo zeuxippus belongs to the *Brassolidæ*—another family which is confined to the New World and which includes some of the largest of the American butterflies. These insects are crepuscular, coming out after sunset and flitting about the roads until it is nearly dark. One species of the genus *Narope* has even been attracted to light like a moth! Mr. Rosenberg says that these "owl" butterflies flap lazily along the road, close to the ground, and despite the remarkable pattern displayed on the undersides, they are very difficult to see when they come to rest on the trunks of trees.



Three species of Heliconius. From top to bottom: H. thelxiope, H. silvana, H. doris doris.

In an article of this description, it would be obviously impossible to attempt more than a brief survey of some of the genera that are typical of Tropical America, and, in fact, are not found in any other part of the world.

Perhaps the most important are the *Heliconiidæ*, butterflies with long, oval wings, and a distinctive "warning coloration." These insects are able to discharge, from glands in the abdomen, a nauseous-smelling fluid and, in consequence, they are left severely alone by insect-eating creatures. They fly very slowly, with a gentle undulating, floating motion, which is almost peculiar to them. During the hours of darkness most butterflies seek to hide themselves. Not so these *Heliconii*; they hang at the end of twigs or upon fully exposed leaves. Being uneatable they need no concealment; in fact they appear almost to advertise their whereabouts, well-knowing themselves to be immune from attack.

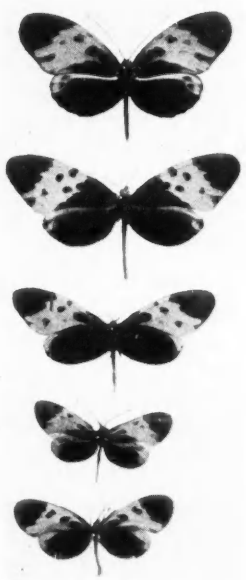
The *Heliconii* have proved a great puzzle to classifiers, owing to the number of closely allied species and numberless intermediate forms. To take an example, *H. melpomene*, the colouring of which is black with a large orange spot on the fore-wings, is a conspicuous and elegant form found throughout Guiana, Venezuela, and some parts of Colombia; it is common at Obidos and reappears on the south side of the river Amazon in the forests behind Santarem at the mouth of the Tapajos river, but, in all other parts of the Amazon Valley, eastward to Pará or westward to Peru, it is entirely absent. In the forest plains an allied species is found, named *H. thelxiope*, coloured black, rayed with deep orange, and having a number of bright yellow spots on the fore-wings. There are districts where most of the *Heliconii* which occur are forms transitional between the two species. These hybrid-looking specimens are connected by so complete a chain of gradations, that it is difficult to separate them even into varieties. The latest view of scientists is that *H. thelxiope* is a local race of *H. melpomene*.

H. doris has four distinct forms—the typical *H. doris doris* has blue on the hind wings, while *H. doris viridis* has a lot of green. Another form is rayed with crimson, whereas the fourth has only a small amount of red on the wings.

Both the blue and green forms have been bred from a batch of eggs laid by one female and, in 1860, Bates bred both the red and the blue forms from one single cluster of caterpillars. Forms intermediate between the red and the blue and the red and the green are not uncommon, but, they are not known to occur between the blue and the green forms.

Now it was these *Heliconii* that gave Bates the clue to the matter of mimicry amongst the butterflies. When he began to study his collections on his return to England, he found that his captures at each successive place he had "worked," bore a striking similarity in the matter of colour and pattern which was peculiar to that locality. Furthermore he found that, on closer examination, a number of his specimens which he thought to be *Heliconii*, although bearing the form and coloration of *Heliconii*, really belonged to the *Pieridæ*—species of the genus *Dismorphia* having used the *Heliconii* as "models."

He also found that some of the genera belonging to the *Ithomiidæ*—notably *Ithomia*, *Melinæa* and *Mechanitis*—mimicked the *Heliconii*. This puzzled him extremely, because these butterflies are unpalatable to birds, lizards and other insectivorous creatures and have a "warning coloration" of their own. He gave the results of his discovery to the Linnæan Society in November, 1861, and the paper that he then read has become a "classic." In 1878, Fritz Müller, the German naturalist residing in Brazil, went several steps further and propounded the theory now known as "Müllerian mimicry." His theory was that "unpalatable forms would profit if and when they produced variations tending to reduce all the species to the same common coloration." Professor Sir E. B. Poulton—than whom there is no greater authority on the subject of butterfly mimicry—comparing the theory of Bates with that of Müller has thus aptly expressed the difference—"Batesian mimicry is like the action of a struggling, unscrupulous firm, which imitates the trademark of a successful house. Müllerian mimicry is like the action of a group of powerful firms, which become still better known, at a lessened cost, by combined advertisement."

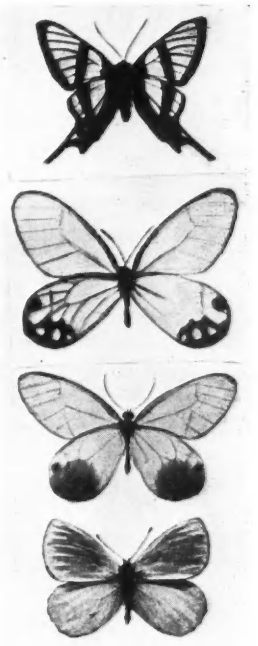


A very fine example of Müllerian mimicry. At the top is Heliconius bicoloratus, *of the Heliconiidæ, while below are* Melinœa mothone, Mechanitis deceptus, Ceratinia semifulva, *and* Hyposcada fallax, *all members of the Ithomiidæ.*

In the three sub-families *Danaiinæ*, *Acræinæ* and *Heliconiinæ*, all of which are specially protected, may be found identical tints and patterns reproduced, often in the greatest detail, each peculiar type of coloration being characteristic of separate geographical subdivisions of the Continent. Thus, in the genera *Ithomia*, *Mechanitis*, and *Heliconius*, there are species with apical yellow spots in Guiana, all represented by allied species with white apical spots in South Brazil. The genus *Actinote* of the *Acræinæ* is mimicked by the Nymphaline genus *Phyciodes*. *Actinote* has a habit of sitting on the wet sand near rivers and pools in parties of perhaps twenty or thirty, amongst which will be found a few *Phyciodes*. If these butterflies are approached, *Actinote* will stay on the sand, and it is possible to sit beside them and even take them up between thumb and forefinger. Not so *Phyciodes*, however, for as soon as the intruder approaches too near for their liking, they are up and away. Similarly, *Papilio Pausanias* is mimicked by *Heliconius sulphurea*.

The large family *Nymphalidæ* contains some of the most typical and brilliantly coloured butterflies to be found in Tropical America. The *Ageronias* have a curious habit of resting on tree trunks, head downwards and with the wings expanded.

The *Catagrammas* are a most vividly coloured genus. They have a very rapid and short flight and have a habit of frequently settling and remaining stationary for a long time upon the trunks of trees. The genus owes its Greek name (*Catagramma*, signifying a letter beneath) to the curious markings on the underside of the wings resembling Arabic numerals. The species and varieties are of almost endless diversity, and the majority inhabit the hot valleys on either side of the Andes. In a genus remarkable for splendour of colour, it is difficult to pick out the most beautiful, but, perhaps *Atacama*, *Parima* and *Excelsior* are the most brilliant. The anterior wings of *Atacama* are deep black, crossed obliquely with a band of orange; the base of the anterior and the inner half of the posterior wings are a deep, glossy blue. The colouring of *Parima* is similar, except that the orange band is replaced by a band of glowing crimson, and the posterior wings are margined with white.



From top to bottom: Zeonia sylphina, Callitæra pyropina, C. aurora, *and* Argyrophorus argenteus.

C. excelsior, which was discovered by Bates, is a larger insect; the wings are of the richest blue, varying with the play of light, and on each side is a broad, curved band of an orange colour.

C. cynosura is black banded with scarlet, with an orange apical spot on the fore-wing. *C. astarte* and *C. peristera* are somewhat similarly coloured, the surface

of the wings having a rich, velvety appearance.

The genus *Eunica* contains butterflies of large size conspicuous by their liveries of glossy dark blue and purple. Next come the *Agrias*, gorgeously coloured insects. Bates, who discovered a number of species, considered that *Agrias sardanapalus* was the most richly coloured species in the whole insect world. The wings of the male are black ; from the base of the anterior wing to beyond the middle, a brilliant carmine, followed by a transverse band of blue. With the exception of the margins, the posterior wings are blue. No description or illustration, however, can give an adequate notion of the glowing effect of colour shown by this butterfly. *A. narcissus* is, if anything, even more resplendent than *A. sardanapalus*—Lord Rothschild possesses a fine series of this species at Tring Museum. The *Agrias* are very rare insects and, moreover, are extremely difficult to capture. Their flight is extraordinarily swift, and when they settle, it is high up on the overhanging tip of the branch of a tree. They will, however, condescend to be lured to the ground by a bait of decaying animal matter. They also visit the sap that exudes from a damaged tree trunk.

Practically nothing is known of the early stages of *Agrias*. From all accounts they seem to prefer the hottest of weather and the wettest of localities and are seldom on the wing till quite late in the morning and then only in the sunniest openings of the virgin forest. The males have tufts of silky scent scales on the hind wings near the body. The females are much duller in colour and very much rarer than the males. More than a hundred different species have been named, but, in the light of modern research, and owing to the fact that more specimens of *Agrias* have been reaching Europe of late years, it is quite possible that many species, hitherto regarded as being distinct, will prove to be local races or varieties, and that there may be only six or possibly fewer distinct species. *Agrias* are always much sought after by museums and those private collectors who have the means to pay the high prices demanded for specimens.

Vivid Colour Schemes

The three genera, *Catagramma*, *Callithea* and *Agrias*, have a somewhat similar arrangement of colours. The most vivid blue ground with broad bands of orange, crimson, scarlet, or a different tint of blue or purple or sometimes green, are exactly reproduced in corresponding, yet unrelated, species occurring in the same locality. Yet, as none of these groups is known to be specially protected, this can hardly be true mimicry. The *Callitheas* emit a strong odour like vanilla.

In the same country a few species of the genera *Eunica* and *Siderone* also reproduce the same colours, but with only a general resemblance in the markings. The beautiful genus *Nessæa*, the members of which have black wings banded with blue and orange, belong to the *Eunicidæ*. The undersides are grassy-green.

Bates, who has a species named after him, says that it is " common in moist places in the forests in the neighbourhood of Pará and is found in smaller numbers, with the exception of certain districts, in the whole Amazon valley. Its flight is extraordinarily rapid, but it is fond of settling on the foliage where a ray of sun breaks through the shadows."

Another genus containing beautiful butterflies is *Epiphele*. *E. epicaste* and *E. eriopis* have black wings glossed with vivid purple and crossed by broad orange bands, and *E. epimenes* is black, glossed from base to beyond the middle of the wings with a brilliant silvery blue, hardly surpassed in beauty even by the *Morphos*.

Cryptic Undersides

Before leaving the *Nymphalidæ*, it is necessary to mention the cryptic undersides of many of the species. Although none are quite so perfect in their resemblance to dead leaves as the Oriental *Kallimas* and *Hebomoia glaucippe*, many of them are quite remarkable. *Prepona meander* has the undersides of the wings divided sharply between olive brown and pale cream and, when resting with the wings raised vertically above the body and their upper surfaces closely apposed, harmonises exactly with a patch of sunlight filtering through the leaves of the bush on which the insect is at rest. The soft, grassy-green of those parts of the undersides of *Nessæa* which are exposed would make the insect very difficult to find amongst the luxuriant vegetation of the region in which they occur. The undersides of *Megalura Coresia* are half dark chocolate-brown and half silver, while some species of the genus *Ænœa*—particularly *basalis* and *discophora*—when resting are materially helped in their disguise by the shape of the wings, which form a window, appearing as a hole made by an attack of a leaf-eating fungus.

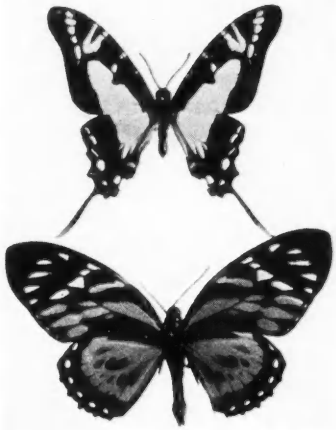
Many butterflies are marked with a distinct median line on the underside of the wings ; in nearly every case of cryptic resemblance to dead leaves, dark markings on the apex of the fore-wing appear to determine the position of this median line by bringing out the resemblance to the midrib of the leaf.

In Chile, at altitudes of 3,000 to 7,000 feet, occurs a shining silvery insect known as *Argyrophorus argenteus*, which is quite different from the general run of Satyrid butterflies. This insect, together with *C. aurora* and *C. pyropina*, are shown in the upper illustration on page 337.

The large family *Erycinidæ* is almost exclusively American, a very great number of species being found in the tropical parts of the Continent. The species are of endless pattern and variety and the majority of them rest on the under surfaces of leaves with their wings expanded, but the gorgeously coloured *Erycinas* rest with the wings erect and exposed as in the majority of butterflies. A curious species, *Zeonia sylphina*, with semi-diaphanous wings and long tails is illustrated on page 369.

Above : Papilio protesilaus.

Below : P. Thyestes zoros P. zagreus.



Except for the *Theclinæ*, the *Lycænidæ* are not so well represented in America as in other parts of the world. The *Theclinæ*, however, are numerous and highly characteristic. Many of them are exceedingly beautiful—especially *Evenus regalis*. Many have the upperside a smooth, metallic blue, while the underside has a frosted appearance which greatly enhances the beauty of the colour. When they fly, which is seldom and then only for short distances, they fly from six to eight feet from the ground. They are distantly related to the Hairstreaks of the British Isles.

The *Papilionidæ* can readily be distinguished from all other butterflies except the *Pieridæ*—of which our Cabbage White is an example—by having six perfect legs in both sexes ; they differ from the *Pieridæ* in having one vein less on the hind wings.

The *Papilionidæ* are classed in three groups—the Aristolochia Swallowtails, Fluted Swallowtails and Kite Swallowtails. In the first of these groups, the male is nearly always distinguished by having the margin of the hind wing nearest the body folded over and enclosing a mass of woolly scent-scales. There are several species of this group to be found in South America, but they are more commonly found in the East Indies and a single example occurs in Madagascar. The magnificent *Troides* mentioned above belong to this group. Some of the American species are small for *Papilios* and have an enfeebled flight, especially the females. Their coloration is black with yellow spots. *P. Tropas* and *P. Chabrias* are not uncommon, but, some are exceedingly rare—in fact, only one pair is known of *P. Hahneli* and *P. Cœlus*. A handsome species of *Papilio* is *P. Childrenæ*, both sexes of which are of remarkable beauty. This butterfly is not found in the Amazon Valley but occurs at higher elevations from Guatemala to Ecuador. The male is black with a large area of the forewings brilliant metallic green, and a spot of scarlet on the hind wings. The female is dark brown with cream spots on the fore and red spots on the hind wings. Such highly developed sexual dimorphism is a very common feature in South American *Papilios*, the general pattern as found in the female *Childrenæ* being common to a large number of species and rendering the correct identification of the females a matter of no little difficulty. Probably the mimicry theory explains this. In the second group—the Fluted Swallowtails—the males can be recognised by having the abdominal margin of the hind wing curved downwards as if fluted beneath. This group contains a larger number of species inhabiting temperate regions than either of the other two, and is everywhere present in the tropics. The more typical Swallowtails—including our English *P. machaon*—belong to this group. Here are shown *P. protesilaus* and *P. thyestes zoros*, two of the long-tailed species of *Papilio*.

The last species shown is *Papilio zagreus*, which is an allied species to *P. bachus* from Ecuador. Anyone might be pardoned for not placing this butterfly amongst the *Papilionidæ*. It has no " tails " on the hind wings and bears no resemblance to the generally accepted idea of that family, but resembles closely the Danaine models of the genus *Tithorea*. The colour of the wings is black, marked with fulvous brown and spots of ochreous yellow. There can be no doubt that its pattern and coloration have been derived in mimetic association with other species, for the same combination of these is met with over and over again, faithfully copied in other genera of South American butterflies—notably *Heliconius* and *Mechanitis*.

In conclusion it may be said that butterflies are unsurpassed by any class of animals for the study of the laws of variation in all its forms. Bates's prophecy has come true—that " the study of butterflies—creatures selected as the type of airiness and frivolity—instead of being despised, will some day be valued as one of the most important branches of Biological Science."

Pachacamac: a Holy City.

By R. G. Walker

The temples in the ancient Peruvian city of Pachacamac await a thorough scientific excavation. Will they yield up the treasure of Inca gold which so many explorers in Peru have sought in vain?

FOLLOWING the coast road south from Lima for a distance of eleven miles, past Chorillos and the Solar Mount, one comes to the ruins of Pachacamac, at one time the Holy City of Central Peru. At the time of the Inca conquest it was occupied by a branch of the Aimara Indians, who had wandered down from the mountains by way of the Yauyos Valley. Of its earlier history there is no record. Occasional and somewhat casual excavations have revealed mummies, ornaments and objects of household use similar to those found at Tiahuanaco, near Lake Titicaca. In higher strata pottery of the later Chimu and Chancay types have been found. The city stands between the mountains and the sea on a shelf of granite, deeply overlaid with sand, which slopes down from a ridge of hills bordering the Lurin river. On one side is the desert, on the other a green valley, abundantly watered. At the eastern entrance to the town are the remains of the temple to Pachacamac, the "god who impregnates the earth." Beneath this, on a broad platform, is an amphitheatre, enclosed by walls and measuring about 300 by 150 feet, in which the pilgrims assembled when they came to receive the word of the Oracle. Adjoining the amphitheatre are the tombs of the tribal chiefs. The more imposing consist of underground vaults, measuring about 15 by 10 feet, connected by narrow passages entered by stone staircases from above. The majority of the tombs are mere niches, cut in the solid walls, in which the bodies were placed either in a horizontal or sitting position.

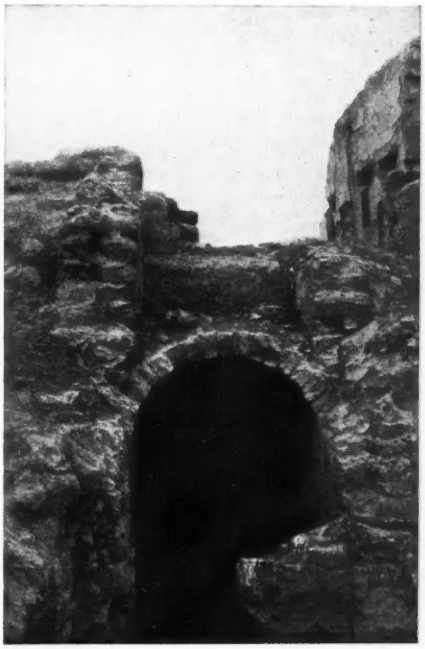
The remainder of the town consists of dwelling houses built of small adobe bricks, laid up and plastered over with mud in its natural colour. The houses are of one storey, rectangular in shape, and have one narrow doorway but no windows. Several are divided into two or more compartments and all had flat mud roofs which have now fallen in. Here and there are seen the remains of a public square, and north of the town, at a lower level, is an extensive plot of walled-in ground which served as the people's cemetery. A confusion of bones and burial shrouds are revealed here by every excavation. Some of the shrouds are made of a stout woven sacking; others are of coarse plaited fibre, the "totora," which is still used by the Indians of Lake Titicaca to make nets and cordage. Beyond the cemetery, on an artificial mound, is a second temple, much more imposing than the first. It was probably erected by the earlier inhabitants of Pachacamac but rebuilt at a later date by the Incas in honour of their own deity, the Sun.

The Temple of the Sun at Pachacamac (above) and, below, the ruins of the temple dedicated to Pachacamac.

West of the town and about 500 yards distant are the remains of another important building, presumably a fortress. One entrance, flanked by massive pillars, faces on a broad

platform artificially raised above the plain. Encroaching sand has buried most of the walls and blocked up the interior, but at one end can be seen the burial vaults and a stone staircase leading to a subterranean gallery with arched roof. A well-defined road traverses the town from end to end and another branches off to join the old Inca highway, which runs from Huancayo, in the mountains, to the coastal town of Huacho, north of Lima.

The older temple, that dedicated to Pachacamac, is built in the form of a terraced pyramid, on an artificial mound which raises it well above the town and the surrounding country. The walls are of granite blocks, red, black and yellow, of irregular size and shape. These are faced with adobe bricks, measuring approximately 14 by 8 by 6 inches, and plastered over with mud. The retaining walls of the hill and the barricades against encroaching sand are of similar construction. Only two of the terraces, or platforms, are still discernible and there is no trace of the many doors or of the decorated walls mentioned by the old chronicler, Cieza de Leon. A great part of the building has collapsed and the interior is completely filled with sand. The subterranean galleries are impenetrable to-day and no serious attempt ever appears to have been made to excavate and lay bare the inner Sanctuary, or Chamber of Sacrifices, which Pizarro's secretary described as "dark and repelling," with an overpowering odour of decomposed blood.



The entrance to the subterranean gallery in the Pachacamac fortress.

The temple to Pachacamac was held in such esteem by the Indians of Central Peru that their Inca conquerors wisely left it alone. They tried to distract attention from it, however, and from the local deity by building, or rebuilding, in more imposing fashion the second temple which they dedicated to the Sun. Like the first temple it is pyramidal on a quadrangular base, with five broad terraces supported by massive retaining walls. The latter are made of small granite blocks, smoothed and polished on their outer faces. Here and there are still visible patches of the bright red paint which originally covered them, causing the whole structure to "glow in the waning light like a building afire." The outer wall of the base, ten feet high, is in a fair state of preservation. So also are the main entrance, facing east, the corridor, and the stone staircase which gives access to the first platform. The next three sections of outer wall forming the pyramid are a tumbled mass of fallen stone and adobe, but the fourth platform, apparently intended for defensive purposes, is comparatively well preserved. It is sunk between the upper and lower walls so as to be invisible from below, and the heavy buttresses supporting the fifth terrace give it the appearance of a cloistered walk in a monastery. On the summit the bases of the dividing walls of the Sanctuary and adjoining buildings are still standing.

The Secret of the Inca Gold ?

As in the other temple all entrances to the subterranean galleries are obliterated, blocked with sand and debris; only thorough scientific investigation will now reveal the secrets of the interior. Therein the Inca priests are said to have buried "four hundred loads of gold" when the avaricious Pizarro marched on Pachacamac.

(*Continued from page* 375)

authorises the concessionaires to settle 10,000 Japanese families in the district, assures them freedom from state and municipal taxes, and empowers them to exploit any minerals found on the estate. Many of the favours granted conflict with the Constitution of 1934, but there is some doubt whether this annuls prior obligations assumed by the State Government.

Independent of the organised colonies, thousands of Japanese are growing cocoa, rice and tobacco, or collecting rubber and Brazil-nuts. Others are engaged in fishing for pirarucú, a large fresh-water fish which, dried and salted, is rapidly taking the place of imported cod on the Brazilian market. Here and there one finds young men from Japanese agricultural colleges. Some have agreements with large property owners under which they work a plot of land, rent free, and share the profits with the landowner. In one case a Japanese capitalist sent out a party of students at his own expense, settled them on a plot of land and undertook to make it over to them if they could constitute a self-supporting colony within five years.

The Japanese in Brazil.

By A. J. Bigley

The problem of foreign minorities is one of ever-recurring interest, and is especially likely to become vital in a land with vast thinly-peopled spaces. Mr. Bigley reviews the question of the Japanese in Brazil with an impartial eye, and presents facts little known on this side of the Atlantic.

THE first Japanese immigrants, numbering seven hundred, landed in Brazil in 1908, and were distributed over the São Paulo coffee plantations. Three years later a smaller batch arrived and was sent to Minas Geraes. These experiments proved so successful that State Governments and planters throughout Brazil clamoured for further supplies. In response to their appeals, and in view of the shortage of labour in all parts of the country, the Federal Government agreed to finance the importation of Japanese in large numbers. At that time, however, Japan was sending her surplus population to the United States, and until 1924, when the North American Republic legislated against yellow immigrants, Brazil's demands were practically ignored. From 1924 onwards Brazil became the Mecca of Japanese emigrants. Fifty per cent. of those who left their homes for countries outside Asia were destined to Brazil. Their expenses were paid by the Japanese Government at first, and later by subsidised emigration societies. They entered Brazil in such numbers that the public and the Press became alarmed and demanded restrictive measures. As a result a clause was inserted in the new Constitution of 1934 limiting the entry of immigrants from each country in one year to two per cent. of the number of its nationals who had settled in Brazil during the preceding fifty years. Under the quota system thus established, 2,894 Japanese were entitled to admission during 1935, but 9,611 actually entered by the various ports.

The Case against Immigration

The advocates of restriction allege that the Japanese, owing to their standards of living, compete unfairly with the small peasant farmers of the interior, and that, as they do not assimilate with the natives, they threaten to form powerful foreign centres in Brazil's vast territory if they continue to enter the country in large numbers. That they are sober, industrious workers, and have rendered valuable service to agricultural and industrial development, is not denied. The number of Japanese at present settled in Brazil is estimated at 270,000 and represents 0.56 per cent. of the total population. Figures published by the São Paulo Government show that 172,169 had entered by the port of Santos to the end of May, 1936, and of these 140,000 are probably resident in the State to-day. They were employed at first in clearing large tracts of virgin forest bordering on the railways. When this was done they were set to work on the coffee plantations. Later, after the collapse of the coffee market, they began to grow cotton and fruits for export and vegetables for home consumption. As a profitable side-line they cultivated mulberry trees and silkworms for São Paulo's latest industry, utilising back yards and every available inch of ground for the purpose. In the course of a few years many became independent and bought or leased small plantations. To-day they own more than 12,000 properties in the State of São Paulo.

New Areas Developed

Apart from these individual activities, a Tokyo syndicate holds a concession from the São Paulo Government to exploit, with Japanese labour, a large area of land on the southern coast, in Iguapé and the adjoining municipalities. This low-lying, fertile region has hitherto escaped development. During the 400 years which have elapsed since the Portuguese first settled there, the few inhabitants, deprived of all transport facilities, have confined their activities to fishing. Now three organised colonies, with a population of 6,000 Japanese, are established in the district. Under the guidance of experts they breed cattle, and grow rice, cotton, maize, and sugar-cane. Where only mud and palm-leaf shacks existed there are schools, hospitals, administrative buildings, and workshops, with industrial plant to handle the produce of the settlement.

From São Paulo the Japanese have penetrated to the neighbouring agricultural States of Minas Geraes, Paraná, Matto Grosso and Goyaz. In Paraná and Minas Geraes there are approximately 20,000. Matto Grosso has 2,000 in one municipality alone, that of Campo Grande, and several thousands are scattered over the vast, sparsely populated interior of Goyaz. The majority are engaged on coffee, maté, and rice plantations, on cattle ranches or in lumber camps. The remainder work independently, digging for gold or diamonds in the alluvial deposits of the great rivers. Farther north, in Pará and Amazonas, Japanese activities are largely controlled by syndicates holding concessions from the State Governments. The most important of these obtained from the Pará Legislature in 1928 a contract to exploit two tracts of land, having

a total area of 2½ million acres, in the Municipalities of Acará and Monte Alegre.

Acará lies about seventy miles south of Belem, the State capital, in the heart of a rich timber district. During the boom years it was a busy centre for rubber gatherers, but after 1912 it fell on bad times. The Indians, remnants of the Tembé and Turuyuará tribes, drifted back to the forests, and the remainder

Typical Brazilian country. Above, a ranch in Minas Geraes; left: a coffee plantation in São Paulo.

of the population, amounting to less than five hundred, made a precarious living growing tobacco for the Belem market. The area of the Japanese concession, covering 1½ million acres, was already partly cleared of forest. Work was commenced in 1929 and advanced rapidly. To-day the colony comprises twelve settlements, with over 400 buildings, fifty miles of good roads and a light railway line. It has electric light, telephones, and wireless stations, schools, workshops, industrial plant, and hospitals. The Japanese population, numbering nearly 2,000, and the native inhabitants produced 1,500 tons of rice last year, besides large quantities of cocoa, cotton, and tropical fruit. They also export timber and Brazil-nuts and breed cattle.

At Monte Alegre, which is situated on the left bank of the Amazon River, near the western border of the State, progress was less rapid, as the concessional area of one million acres consisted almost entirely of virgin forest. This wilderness has now been cleared and replaced by extensive rice, cotton, tobacco and cocoa plantations, connected by good roads and a light railway. High-grade cotton with a long resistant fibre is being produced, and recent experiments with mulberry trees and silkworms have yielded a good quality silk. Monte Alegre, like Acará, has electric light, telephones and wireless stations, hospitals, schools and industrial plant.

In addition to these larger colonies the syndicate administers a small settlement at Castanhal, 40 miles west of Belem, on the Bragança Railway. There the chief products are cocoa, lumber, fruits and vegetables. At Bragança an experimental station is maintained to advise the colonists, and at Belem, the port of disembarkation, a hostel has been built with accommodation for 500 immigrants. New arrivals are kept there for a time under medical observation, and receive instruction in hygiene and local conditions, before proceeding to the settlements. In Amazonas at least three colonies are maintained by private enterprise, and two, deriving from State concessions, are administered by a syndicate. One of these is at Salishi, near Manaos, and the other is at Maués, south of Tupinabarana, an island formed by the Amazon and its tributaries near the Pará border. Later the syndicate acquired properties at Parintins, on the banks of the Amazon, at the eastern end of the island, and transferred the bulk of its activities there, on account of the better transport facilities.

The chief products of the Amazonas settlements are rice, cocoa, and guaraná. The latter, a fruit from which guaranina, the basis of eurythmine, is extracted, has found a ready market in Japan. Like most of the surplus production of Japanese activities it assists Japan to meet its reciprocal trade obligations towards Brazil. An option on another concession of 2½ million acres in Amazonas was granted by the State Government to two Japanese prior to the 1934 immigration laws. The concession is a valuable one, as it comprises land situated on the banks of navigable rivers, in one of the most populous and fertile regions of the State. It

(*Continued on page* 373)

The Caracol

By R. K. Wakely

The most perplexing of the great ruins of the ancient Maya city of Chichen Itza is the building called the Caracol. The purpose of its construction is still a matter of conjecture, and it cannot be dated with certainty.

In 1931 the final work of clearing, excavating and measuring the strange ruin called the Caracol in the Middle Period part of the Mayan city of Chichen Itza was completed. That puzzling building stood revealed in all its grandeur, freed from the tangle of the jungle which obscured it for so many centuries.

Since that date the best brains of the Carnegie Institution of Washington have been at work on the problems that it presents. It was demonstrated that in a small chamber at the top of the tower, now almost demolished, there is a stone-lined passage, 2 feet 10 inches high, and 2 feet 3 inches wide, looking due west to the horizon. It has been suggested that this passage may have been used as a line of sight for determining the occurrence of the summer solstice and of the vernal and autumnal equinoxes. Careful observations show that the diagonal from the inner right jamb to the outer left jamb is the line on which the sun sets on March 21st and Sept. 23rd, the dates of the vernal and autumnal equinoxes.

The observations show, also, that the diagonal from the inner left jamb to the outer right jamb is within 5° of the line on which the sun sets on June 22nd, which is the date of the summer solstice, *i.e.*, the date when the sun in its apparent motion reaches its most northerly position.

Mr. Karl Ruppert supports this suggestion, though he thinks that the evidence does not justify a definite statement. Mr. H. E. D. Pollock, in his *The Round Structures of Aboriginal Middle America*, suggests that the peculiar properties of the Caracol tower are to be associated with the worship of Kukulcan, the Maya counterpart of Quetzalcoatl, the Mexican god of the wind, and that such buildings were inspired by the Mexican conception of Quetzalcoatl.

Dr. A. V. Kidder believes that these two views are not incompatible. Certainly with the Mayas the dividing lines between astronomy, astrology, geomancy and religion were very vague, for everything hinged on the universal preoccupation with the powers of nature and the protection of the maize crop. A temple of Kukulcan would have been a very suitable place for the conduct of astrological activities.

The tower itself is 43 feet in height, and has a diameter of 36 feet at its base. It rests on a solid circular masonry platform, and consists of two concentric walls enclosing vaulted chambers. The outer wall, three feet thick, has four doors. A spiral staircase, winding counter-clockwise, so low as to necessitate a stooping posture, rises 12 feet inside the tower, and ten more steps, rising another 8 feet, probably existed originally. Although the upper part is badly damaged, it is obvious that a second storey room was included in the building as it was constructed. This was probably about 8 feet from north to south and 5 feet from east to west.

The circular platform upon which the tower rests is enclosed by a second platform, probably built later,

This photograph of the Caracol was taken in 1930 *towards the close of the preservation work carried out by the Carnegie Institution. The main features of this perplexing ruin are revealed, though it will be noticed that the top of the tower has suffered too severely to permit of accurate measurement. The picture is taken facing east, and behind the tower may be seen the top of the well-known Monjas.*

which rises 24 feet from the ground and measures 169 feet from east to west by 220 feet from north to south. A stairway of 22 steps rises on the west from ground level to the top of the first platform, another flight of 15 steps leading to the top of the second platform, upon which the tower rests.

There is hope that the Caracol may in due course be conclusively dated, for as long ago as 1923 Dr. S. Morley found a group of 132 glyphs on a niche of the upper terrace stairway. Although many of these have been deciphered, certain inconsistencies in the results deter him from making a definite statement. Dr. Pollock believes that while the main building is cast in the Maya mould some of the superficial features are reminiscent of the Mexican era. "The architectural evidence," he says, "may best be interpreted by assigning the circular stages of the structure to the opening years of the Mexican period at Chichen Itza."

In terms of one system of converting Maya chronology into our own, the building might thus be placed toward the close of the 12th century; according to another system it would be dated about three-quarters of a century later. Indirectly supporting this conclusion is the fact that the Caracol is situated in a quarter of Chichen Itza in which all other important structures are of the so-called Middle Period, A.D. 1000 to 1200.

Hills of the Dead

In March this year the important discovery was made by Dr. A. V. Kidder, the Maya specialist, of a stucco-covered burial mound in the highlands of Guatemala. Excavation was begun forthwith, and before the rains brought an end to the work, many important discoveries had been made.

The pyramidal construction of the mound itself was of great interest, as none of the pyramid structures characteristic of the lowland Mayas had previously been found in the highlands; and the missing proof of a highland culture, equally sophisticated with that of the lowlands, was now forthcoming. Among the objects excavated the most important was an incense-burner of coarse pottery, 18 inches high, found associated with a skeleton in the second tomb opened. A very fine piece of carved jade was also unearthed, very similar to specimens from the lowland Old Empire city of Uaxactun, while a beautifully finished tripod pottery vessel, in the form of a fish, came to light from the third tomb.

The first tomb to be cleared was a vertical-sided pit, twelve feet square and twelve feet deep, dug into hard, volcanic deposit. Originally it had been roofed with logs which had rotted away, letting down stones and

Left, a figurine of baked pottery, almost ten inches high, painted green to represent jade, found in the third tomb. Right, an incense-burner, almost 18 inches high, found in the second tomb. The smoke passed upward through the hollow interior and issued from the armpits and mouth.

earth upon the contents. The pit was found to have been lined with rush matting, and its floor covered with a half-inch layer of brilliant red paint. The personage who had been interred had apparently been placed in a sitting position in the middle of the floor. In close association with the skeleton were thirteen pottery vessels, nine beautiful obsidian spear-heads, several obsidian knives, a slate-backed mirror faced with iron pyrites, jade beads, a carved jade pendant, and what had evidently been two jade mosaic ornaments, perhaps ear-plugs. On three sides lay single human skulls and on the fourth, the skull of a jaguar.

The second tomb contained the bones of a middle-aged man and a young woman, with a number of human effigies, and the third a well-preserved male skeleton and the remains of two slaves; all three were buried in a sitting position, facing south. The site, hitherto known as Miraflores, was named "Kaminaljuya," meaning in Quiche Indian language "Hills of the Dead."

The discoveries in these tombs should do much to fill out the scanty story of the rise of the Maya Empire, and provision is to be made in the future archæological programme of the Carnegie Institute for a thorough study of the area around Kaminaljuya.

The Forest Tour, organised by the Booth Line, by which travellers may journey 1,000 miles up the Amazon in a comfortable steamer, still remains one of the best methods of visiting South America. The *S.S. Hilary* makes the first trip in 1937, starting on February 6th, and followed by the *S.S. Anselm* on February 26th.

Correspondence.

SOUTHERN SPAIN TO-DAY.

To the Editor of DISCOVERY.

Sir,—In connection with my article on the Archæological Research Work at Niebla in Southern Spain in the August number of DISCOVERY, I am asked by Mrs. Bernard Whishaw, Director of the Archæological School there, to assure readers who may have thought of visiting that historic town that all that part of Spain is now at peace. Since its occupation by the Insurgent Army the people have been happy in the complete restoration of law and order and of a security they have not experienced for many years.

Tourists can now travel to Niebla, which is one hour-and-a-half by motor-bus from Seville, and 45 minutes from Huelva, via Gibraltar, unless they prefer the interesting route by Lisbon.

Yours faithfully,

M. LA TROBE BATEMAN.

Streatley, Berks.

SEX AND CIVILIZATION.

To the Editor o, DISCOVERY.

Sir —I trust you will allow me to protest against Mr. F. S. Marvin's serious misrepresentation of my book, " Sacrifice to Attis ; a Study of Sex and Civilisation " in his review in the November number of DISCOVERY. Mr. Marvin omits the explanatory sub-title of the book and then states that my main topic is the falling off in the birth-rate and that I have not dealt with this relevantly or consistently. Actually, my main theme throughout the book is the conflict between man's primitive sex urges and the restraints which Society has imposed upon the exercise of those urges, and I have examined the fall in the birth-rate as it affects the future simply as one result of that conflict. Nine-tenths of the book deals with the evils which I believe the conflict leads to in the living generation, such as prostitution, criminal abortion, much unhappiness in marriage, juvenile crime, mental disorders and suicide. But not one of these subjects does Mr. Marvin even mention. He appears to have jumped to his conclusion that it was a book on the birth-rate after reading the first few pages and then all the rest necessarily became to him " irrelevant and inconsistent."

Mr. Marvin goes on to state that " somewhere " I have spoken of " heroic measures " but have not said what they are. Actually, I have advocated giving children sex information at an early age ; recognising the sex maturity of both sexes soon after the age of sixteen and encouraging early marriage ; revising the law relating to abortion ; lifting the ban on the sale of literature dealing with sex themes ; widely increasing the grounds for divorce ; and placing the economic burden of maternity and the rearing of children upon the State.

Finally, Mr. Marvin asks if I want a dictator. Since I have strongly criticised modern education and the methods of handling youth generally as inculcating excessive respect for authority and thereby conducing to the growth of Fascism, I am completely at a loss to understand how he can make this suggestion.

Yours faithfully,

WILLIAM A. BREND.

London, S.W.11.

Books Received.

The Cambridge Ancient History : Vol. XI. The Imperial Peace, A.D. 71-192. Edited by S. A. COOK, F. E. ADCOCK, and M. P. CHARLESWORTH. (Cambridge Univ. Press. 35*s.*)
A Short History of the Future. By J. LANGDON-DAVIES. (Routledge. 10*s.* 6*d.*)
The Mechanism of Nature. By E. N. da C. ANDRADE. (Bell. 7*s.* 6*d.* ; revised and enlarged edition.)
Relativity Theory of Electrons and Protons. By SIR ARTHUR EDDINGTON. (Cambridge Univ. Press. 21*s.*)
Prelude to Chemistry. By JOHN READ. (Bell. 12*s.* 6*d.*)
The March of Chemistry. By A. F. COLLINS. (Lippincott. 12*s.* 6*d.*)
The New Chemistry. By E. N. da C. ANDRADE. (Bell. 3*s.* 6*d.*)
Biological Time. By LECOMTE DU NOUY. (Methuen. 7*s.* 6*d.*)
Strange Sea Shells and their Stories. By A. H. VERRILL. (Harrap. 10*s.* 6*d.*)
At the Zoo. By JULIAN HUXLEY. (Allen & Unwin. 5*s.*)
The Junior Bird Watcher. By E. FITCH DAGLISH. (Routledge. 6*s.*)
Animal Lover. By GERVASE LAMBTON. (Witherby. 5*s.*)
The Birds of Tropical West Africa. Vol. IV. By D. A. BANNERMAN. (Crown Agents for the Colonies. 22*s.* 6*d.*)
British Grasshoppers and their Allies. By MALCOLM BURR. (Phillip Allan, 6*s.*)
The Dawn of the Human Mind. By R. R. SCHMIDT. (Sidgwick & Jackson. 12*s.* 6*d.*)
The Earth Goddess. By G. HOWARD JONES. (Longmans. 12*s.* 6*d.*)
We, the Tikopia. By RAYMOND FIRTH. (Allen & Unwin. 30*s.*)

(*Continued on page* 387).

Tuberculosis and a Stamp.

Tuberculosis has been taking its toll of human life probably from prehistoric times. In 2698 B.C. it is described in some of the ancient books of China. In 2500 B.C. the Rig Veda includes a cure for " Yakshma," that is, tuberculosis. The Ayur Veda, an early work on Hindu medicine, recommends good food and early treatment for it. The death of an Egyptian about 1000 B.C., whose mummy was recently examined, has been ascribed to tuberculosis of the spine. Throughout the middle ages and modern times this disease has continued its ravages almost unchecked, and not until the discovery of the tubercle bacillus by Robert Koch in 1882 did the way to fight it become clear. Yet in spite of that there are still over one hundred people dying from tuberculosis in the United Kingdom every day.

The Greeting Stamp

Tuberculosis is both a curable and preventable disease. The special effort, therefore, which is being made under the auspices of the National Association for the Prevention of Tuberculosis, at Christmas time, to fight it through the voluntary bodies known as Tuberculosis Care Committees, will receive general sympathy. This effort takes the form of a sale of Christmas Seals, which are little greeting stamps used for sticking on the flaps of Christmas letters and on parcels. If you buy them and use them you will be helping to provide funds for this worthy cause. They cost ½d. each, 6d. a dozen or 4s. a hundred, and are on sale locally by Tuberculosis Care Committees in many parts of the country. Otherwise they may be obtained by writing direct to the National Association for the Prevention of Tuberculosis, Tavistock House, Tavistock Square, London, W.C.1.

The Quest of the Amazon Fly

By John Golding Myers

Imperial College of Tropical Agriculture, Trinidad.

Economic entomology sounds a most unexciting occupation; in the tropics, however, it is apt to be otherwise, as Mr. Myers's account of his quest amply proves. By good luck the Amazon Fly was brought from its native haunts to the West Indies without loss of life; but the task proved hazardous and comfortless enough to satisfy the most avid explorer.

SUGAR prices had reached unprecedented depths. The best organised industry in the West Indies was getting less than ever for its brains and its sweat. And the borer continued to reduce the annual output by 20 per cent. Abolish the borer, and the same outlay on the same area would produce 20 per cent. more sugar—perhaps the difference between success and failure for those estates which were hovering on the margin. For five years, under the auspices of the Empire Marketing Board and the Imperial Institute of Entomology, I had been combing the American tropics—the West Indies, the Guianas, Venezuela and Brazil, for a natural enemy of the borer, a parasite which would aid us in the unequal fight against this well-protected pest. The story of the search, involving considerable difficulty and adventure, is too long to relate here. Many new parasites were found, novel, interesting, even effective, but usually under special conditions which we could not hope to imitate in the cane-fields of the coast and the islands. At last, in 1932, a parasitic fly was discovered in the middle of the lower Amazon, near Santarem, which I was convinced would adapt itself to live and work in Demerara and in certain of our sugar-producing islands.

Some of the "labour" at Saracura, Santarem, Amazon.

Here, in this vast alluvial plain, intersected by the thousand channels of the greatest of rivers, were hundreds of square miles of floating grasses, vast prairies buoyant on a muddy, richly nourishing flood. Here was an immense population of sugar-cane borers living in the grasses which had fed them for æons before the companions of Columbus brought sugar-cane from the Old World. And here was the parasite, a queer-looking fly, searching them out in their furthest hiding-places. The first part of the job was done. It remained, in the succeeding year, to find ways and means of transporting the fly to Georgetown, British Guiana, rear it in immense numbers and release it to its beneficial task in the cane-fields of Demerara. The entomologist, spiritual descendant of the proverbially unpractical butterfly-hunter, must turn into a business man and estimate costs, arrange transport, and later turn navigator, engineer, doctor, labour-boss, politician, and bush-man, all in the campaign against tropical insect pests.

We could transport the fly only in the puparial (chrysalis) or resting stage, and this endured at most some nine days. Nine days, in other words, was the most we could spend between the collecting of the insect in the field and its arrival in Georgetown. There was the commercial air-line on the coast, making the journey from Pará, at the Amazon mouth, to Georgetown in one day. But our collecting-ground was some 470 miles from the mouth of the Amazon, and the cost of a chartered plane for the five or six trips we should require was prohibitive. Nor were any of the ordinary river-steamer services which occasionally stopped at Santarem sufficiently dependable to make sure of catching the coastal plane. The only solution was a fast motor launch;

and one which appeared to be suitable was bought. The *Rima* was a trim little craft—28 foot, with a Kelvin engine—which we all loved. She proved eminently seaworthy and fitted for the work she was called on to perform in the often heavy seas of the lower Amazon. Her keel and her general structure, however, made her quite unsuitable for the encounter of rapids, and this, we knew, was a big risk, when, for reasons

Paraíso, Rio Branco.

which need not be detailed here, I decided to take her into Amazon waters by the Essequibo and so over the watershed into the Rio Branco and Rio Negro.

It was a large and varied party that left Bartica, the river port for the Guiana interior, on May 30th, 1933. My experience of rapids had been small. I was therefore glad to link up with a supply column for the Boundary Commission, in charge of my old friend Mr. Theodore Orella. We were five boats in all, some inboard launches, others with outboard motors, which passed the inspection of the river police. The *Rima*, for safety's sake, carried no cargo, and I allowed no one to travel in her but a skeleton crew and myself. Two other boats, regular hardwood river launches, made for the rapids, carried the other members of the expedition and our stores, and two more belonged to the Boundary Commission party. The crews, mostly blacks, contained a sprinkling of good experienced men and a mixture of the riff-raff of Georgetown, for there had been a great demand for boat-hands for the Boundary Commission and for the American La Varre expedition.

The events of the first week's journey up-river are somewhat obscure to me now. I was suffering from widespread sinus infection and fever consequent on a badly pulled tooth, and have retained only a general recollection of much pain, many difficult rapids, incessant rain, and recurring commissariat problems which my wife nobly tackled and solved. On June 7th our main supply boat was stove-in and sunk, but salvaged with all its stores and temporarily patched with a piece of green river-guava wood. A halt was necessary to dry the sodden stores in the intervals of tropical showers. With so many boat-crews the camps were crowded and unpleasant, and Orella, impatient at our slow progress, decided to go on with one boat, containing the more valuable part of his cargo, and await us at the mouth of the Rupununi River, beyond the last rapids. His remaining boat, the *Gray Master*, was captained by William Cuffie, a hawk-faced negro of Benin type, who thus became my head boat-captain and took charge of the navigation.

In the rapids the captain or steersman holds the safety of the boat and the lives of the passengers in the hollow of his hand. An inch too much on one side or the other means destruction. Captain Cuffie, standing in the stern, was a figure to trust—terrific concentration marked every line of his fine features and their fierce black eyes. He was clad in a huge spreading felt hat and a pale sea-green chemise of flannel, with dainty crenellated edges, reaching to mid-thigh. He and the great stern paddle seemed one. His yells of command, rising above the roar of the falls, the noise of the engine and the shouts of the men, were instantly obeyed. (Cuffie was killed in the same rapids the next year.)

So, with infinite toil where the boats were hauled up bodily with ropes, and some excitement where the captain decided to battle with the rapids by sheer force of engine alone, we won through to the last falls below Rupununi Mouth—the dangerous Gold Fall. The attitude of my three white assistants, who had seen no bush work before, was one of anxious expectancy as to what might happen next. This morning two of them, tired of being soaked to the skin day after day, begged to be allowed to travel in the *Rima* with me. I at first refused, but finally reluctantly gave in, thus very nearly signing their death-warrant. We had nearly surmounted the wide and ferocious chaos of Gold Fall when the launch struck a rock, was swept broadside on, fetched up against another submerged and isolated pinnacle, and overturned. I seized my microscope in its heavy case, but was compelled by the force of the waters to let it go, if my own safety were to be of any

The pilot and engineer-captain of the "Rima."

moment. After what seemed an interminable struggle under water with gear and seats and gunwale, my chief assistant and I managed to extricate ourselves and clamber half-drowned from underneath, to join the shivering men on the barely exposed and slippery keel. The second assistant had been carried down the rapids on the tenting, the iron stanchions of which had been wrenched out like grass stems. A life-line from my wife's boat rescued him just as his novel craft was finally breaking up.

Most of our scientific gear—microscopes, binoculars, and personal belongings—were lost, but every man was saved by the other boats. Hurriedly unloading the *Gray Master* at the nearest island, we pushed out again with Cuffie and a select crew and endeavoured at the risk of our lives to prise up the *Rima* with poles and salvage her from her precarious and, as I thought, hopeless position. In this we were successful, and the engineers working all night, though my own spare parts and tools were at the bottom of the river, managed to get her to run again, rather haltingly, the next morning.

We towed the *Rima* nearly to the top of the falls and she finished the passage successfully alone. On Cuffie's urgent insistence, not to mention my wife's, I had deserted her and was travelling in the *Gray Master*. When nearly through the rapids we were blocked by my wife's boat, which was in some temporary difficulty. We had to turn about and run down the fall with a view to making another attempt. But in what we all supposed to be deep water the *Gray Master* struck an isolated rock, water shot like a geyser six feet into the air, by the engine emplacement, and in less than two minutes there remained on the troubled surface no sign of that large, 40-foot boat and her seven tons of cargo save a few struggling men. This time we were rescued by my wife's boat, which turned and ran the fall to our aid, and was soon within an ace of being swamped by the struggling, frantic blacks. Again no lives were lost.

The "Talha Mar" at Santarem.

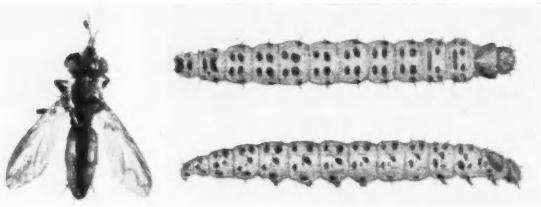
Then, and not till then, was I able to extract the information, from a reluctant junior captain, that there was an *itabo* or side-passage up which the boats, at certain seasons, could be hauled, thus avoiding the wide and dangerous sweep of the main fall. I at once ordered all boats to be taken by that route, and two days later we reached Rupununi Mouth, and an anxious Orella—who had waited for us a full week—was acquainted with his loss. Since we had to send back and wait for a boat to Gold Fall to bring up the men and stores it had not been possible to accommodate after the accidents, it was already June 27th before we reached Yupukari, on the Rupununi, paid off the black crews, sent back all boats save the *Rima*, and prepared for our land journey over the savannahs.

Hauling one of the boats up a rapid, near Essequibo.

The rancher who had agreed to help us with oxen to drag the launch across some 20 miles of savannah on the watershed had given us up and returned to his home. When we were in touch with him again, and had transferred most of the party and the stores to his ranch on the Pirara—a quaternary tributary of the Amazon—it was already the end of June and the rains had begun. The flooded savannahs once more formed an immense lake—Parima—the site of Manoa, Raleigh's fabled city of wealth with its gilded ruler, El Dorado.

After trojan efforts by Mr. Hart, the rancher, and Mr. Alan Pickles, my first asistant, helped by local aboriginal Indian labour, the separated axles of a bullock cart were lashed under the launch as she floated in the river, and the bullocks hauled her out. The trek across the roadless savannahs under the same power was uneventful, save on one steep slope, lightly wooded with sprawling savannah trees. Here the chained wheels of one side proved an insufficient brake, the unwieldy combination gathered momentum, swayed and hurtled down, ripping off branches right and left, and threatening to overwhelm the now galloping oxen. Hart and Pickles and I reined in our horses and helplessly watched what we thought once more must be the doom of the *Rima*. But all fastenings held, and the *Rima*, when we launched her on July 3rd, in waters destined for the Amazon, though badly scratched and bumped, and her

fore-deck stove-in by the rapids, did not leak. But all was not yet plain sailing. Town supplies by now were all eaten, and we had changed to the savannah diet of sawdust-like cassava farine and dried beef. My negro engineer was so disgusted with this coarse but nourishing fare, and so outraged at the hardships he had been called upon, he said, to endure, that he deserted us there and then and had to be paid off. There was no prospect of another nearer than Manáos, and Manáos was about 600 miles in front of us. Mr. Pickles, having learned now, by strenuous experience, that tropical entomology involves other things besides insects, stepped gallantly into the breach, and with myself at the helm, the expedition set out for the Amazon, already several weeks late. At Bôa Vista a Brazilian pilot was engaged for the rapids of the Rio Branco, and the *Rima* was now crowded with eight people on board, and much stores and kerosene. At night we slept at tiny clearings in the giant and otherwise continuous forest, and enjoyed the humble but generous hospitality of small settlers struggling against a green wilderness and an especially virulent type of malignant malaria. We were now in Brazil, and near the Equator itself.



The Amazon Fly (Diatræa saccharalis), *and (right) mature larva magnified one-and-a-half times.*

On the fifth day after leaving Pirara and the British frontier, the much abused engine, ill-served with tools and parts after its battering and soaking in the rapids, gave out utterly and we had to paddle and drift to a suitable landing-place. We came with difficulty to a riverside palm-hut tenanted by an aged couple, who dejectedly informed us that we could not land there. Nor could we—the river was high—the land was lost somewhere in the depths of the Amazon forest, and a foot of water covered the floor of their miserable dwelling. We spent an uncomfortable night and managed, next day, just to reach a haven of higher bank near the mouth of the Rio Branco, a one-house settlement of debilitated malaria patients, known as Paraíso—Paradise, no less. There was nothing to be done but wait till a chance river steamer could take us in tow. The clearing was in complete possession of fire-ants which made every step outside the yard a torment. The bare ground about the buildings was slippery with green slime. Refusing a hospitable invitation to the single house, with its numerous family, we were given possession of the largest outhouse, where we slung our hammocks over miscellaneous stores and a large tray of capyvara meat. A capyvara is an animal of considerable size. This one had been shot some days before—I hesitate to suggest a week, in that tropical and steaming atmosphere — b u t w e thought so. It had been cut into thin slabs to be sun-dried, but the succeeding days had been continuously wet, and no sun came during our three days' stay. It seems that our hosts had forgotten it, but we found it impossible to do so.

After many delays, caused first by the difficulty of obtaining a tow, and later by political difficulties and by malaria, we at last succeeded in reaching Santarem.

In spite of our so long delayed arrival, the Amazon fly, the parasite we had come so far to obtain, was still plentiful, and it was only a matter of organisation to set up a field laboratory, explore the neighbouring *igarapés* and *paranás* for suitable collecting-grounds, make further studies of the life-history and general biology of the fly, train local collectors, and make arrangements for the regular shipment to Pará. Means of transport on the Amazon, near Santarem, are confined almost entirely to water. Practically all the material shipped, or from which further supplies were reared in the laboratory, was collected with boats and *montarías* (dugout canoes). At the height of the campaign, in addition to the *Rima*, which ran from Santarem to Pará, we employed a small fleet consisting of a motor launch, a small sailing-boat—the *Talha Mar* or " Cutter of the Seas "—and eleven *montarías*. Some of the richest collecting-grounds were ten miles and more from the laboratory and the frequent heavy seas at that season, in stretches of open water three or four miles across, made travelling uncomfortable and at times dangerous.

As a rule whole families, with their *montarías*, the hire of which was included in the daily wage, were recruited near the collecting-grounds, the men and boys bringing in the water-grasses containing borers and their parasites, the girls and young women dissecting these out, and the older women cooking the food for the party.

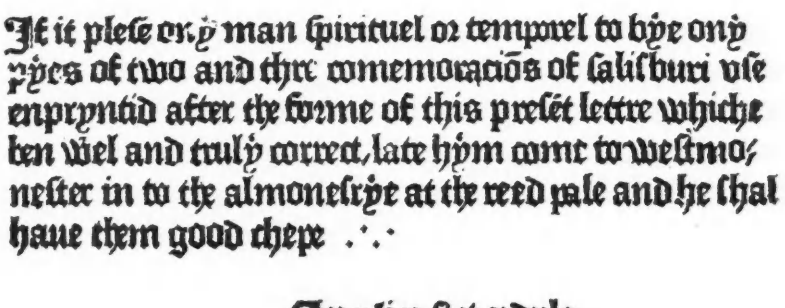
Within six months, the Amazon Fly, bred up with infinite care and wonderful skill by Mr. L. D. Cleare, Government Entomologist of British Guiana, was established in its new home. It has since been introduced into St. Lucia, and is now widespread in the cane-lands of both these colonies, where it is killing a larger proportion of the borers every year.

Early Advertising in England

By Norah Richardson, F.R.Hist.S., F.R.S.A.

Advertising is not, as many believe, characteristic of the last hundred years. It was a real force in English life at the time of the Protectorate, while the first printed advertisement appeared as long ago as 1477. We are indebted for the illustrations to the courtesy of the editor of the Journal of the Royal Society of Arts.

THERE are few characteristics of the highly civilised life of to-day that we regard as more essentially modern than the art of advertisement. We are prone to consider it as, at the very earliest, a product of the 19th century, and we usually regard America as its country of origin, assuming that all we in England know about the subject America has taught us. As a matter of fact, however, there are few arts more definitely native than the art of English advertising. Its recorded history goes back to the year 1477, thus covering a period of more than 450 years; and expressions in some form or another of the spirit of advertising are to be found in our records at a far earlier date. Every modern advertising firm would probably give us a different definition of the word "advertisement," but the spirit of advertising may perhaps be defined psychologically as an attempt to arrest attention, to hold attention, and to suggest action. Such ends have been achieved, from the very earliest times, by writing or drawing upon walls, and by the setting up of signs. There are well-known Roman examples, from Pompeii and elsewhere, of such notices, written, carved or painted, calling attention to goods for sale, or to gladiatorial combats.



The first English advertisement, printed by Caxton in 1477.

Although no examples from Roman Britain survive, there is evidence at Bath that its Roman tradesmen were sufficiently up-to-date to stamp their commercial products with a name and trade-mark; so that it is at least arguable that they also used such other methods of advertising as were familiar in the Empire. Certainly, the sign, which is particularly potent in its appeal to a purchasing public which cannot read, was well established in these islands from Saxon days onwards. We can see it in the Bayeux tapestry, and find references to it, or actual survivals, right up to our own day. Nor did the sign denote the inn only. Until the close of the 18th century, by which time street numbering had come in and a greater proportion of the public was able to read, every tradesman carried on business under a sign. "They have pictures hung at their doors," said Goldsmith's Chinaman, Altangi, "informing the passengers what they have to sell." Interesting examples of all types of sign can be seen at the Guildhall and other London museums; and a familiar survival of the sign as denoting some business other than an inn is the barber's pole still used to-day.

Another interesting form of early advertising was the showman's canvas banner. This was a painted picture, hung out, more especially at fair times, showing the dwarfs, mermaids, six-legged calves, or other entertainment offered by the travelling shows. By Elizabethan days the banner, as is shown by evidence from contemporary ballad and drama, was an established method of advertising. It is particularly memorable because it employed both colour and direct representation (rather than the symbol), and is thus more closely allied to the modern poster than the sign.

Such manifestations of the advertising spirit do not, however, entirely meet our modern conception of what an advertisement is. To the complete art of the advertiser the art of the printer must surely be essential. And it is fitting that we should be able to look back to the father of English printing as the father also of the English advertisement. In 1477 Caxton issued a little notice, measuring $5\frac{3}{4}$ inches by 3, of "pyes"—that is to say, copies of rules—for the commemoration of

Shopkeeper's bill of the early 18th century. Note the smokers conversing about their tobacco, quite in the modern "strip-cartoon" style.

saints' days according to the famous Sarum Use, which were to be had from him "good chepe" at the "reed pale," his printing office (marked by a red pale or fencing) in the Almonry at Westminster. This excellently effective notice, in Caxton's beautiful and dignified No. 3 type, of which the original is in the Bodleian Library, is the first known English advertisement. Similar printed notices soon followed, and were used for hand distribution, or, more especially for sticking up on posts, from which they were frequently torn down: hence Caxton's rather pathetic postscript, "*Supplico stet cedula*," "Please do not tear down the schedule." The next that has apparently survived is a quack doctor's bill, preserved at the Royal College of Surgeons. It dates probably from c. 1525, and tells how one Master Gervaes cured "the canker, the colick, and the skarre in the lippe" (and various other diseases), "the poor freely for the love of God, the ryche for a reasonable rewarde." This has great importance in the history of advertising, for it has a charming wood-cut border—a Gothic design on the one side, and clumps of daisies on the other—and seems to be the earliest existing decorated advertisement.

By Master Gervaes's time the whole idea of commercial advertising had notably advanced, and a settled home was soon to be found for the small printed notice such as Caxton's or his own. This was, somewhat surprisingly, the church door, long the correct place for the display of ecclesiastical notices, and now appropriated also by the vendor of secular goods. The ecclesiastical notice, which dealt with benefices and clergy, usually began with the Latin words, *si quis;* and the earliest English word for the small printed advertisement was "a siquis," while the verb, "to siquis," meant to advertise. No church door was better fitted for the display of notices than that of old St. Paul's. And, as the busy throng of Tudor days pressed into "Paule's walk," the central aisle of the cathedral, there, with complete irreverence, to barter news and gossip and to transact its everyday affairs, it passed through the great north door, which was so covered with small advertisements that it was known as the Siquis Door.

The small displayed advertisement, however, although it had found a settled home on the Siquis Door, was still scattered abroad in hand-bill form or pasted up on posts and walls. The theatre folk, from "The Globe" or "The Curtain," used so to "set up their bills inviting to plays." The booksellers also displayed the title-leaves of new works as advertisements in the same way, or set them up in cleft sticks outside their places of business. Thus, by the end of the 16th century, the printed notice on the church door, or otherwise distributed and displayed, the tradesman's sign, the showman's painted banner, and the bookseller's title-leaf in its cleft stick, were all familiar to the purchasing public. And in 1611 the first clear definition of an advertisement may be found in Cotgrave's French-English Dictionary, where the word *plaquard* is explained as "a bill, siquis or libel, stucke upon a poste." Poster advertising, though of a very elementary kind, seems certainly to have been established by this date.

The next step was newspaper advertising. The English newspaper was born in 1620, but it was not until February, 1626, that the first newspaper advertisement appeared, in *Mercurius Britannicus* for that date. This was a bookseller's notice of a pamphlet* concerning the marriage of Prince Charles of Wales (now King Charles I) and the Princess Henriette Marie of France. But for many years no one seems to have realised how wonderful an advertising medium the newspaper might become, and it was 1647 before the next newspaper advertisement appeared. In May, 1657, however, Marchamont Nedham, the journalist, issued a queer little newsbook, called *The Publick Adviser*, which was the first real advertising organ. The word "advice"

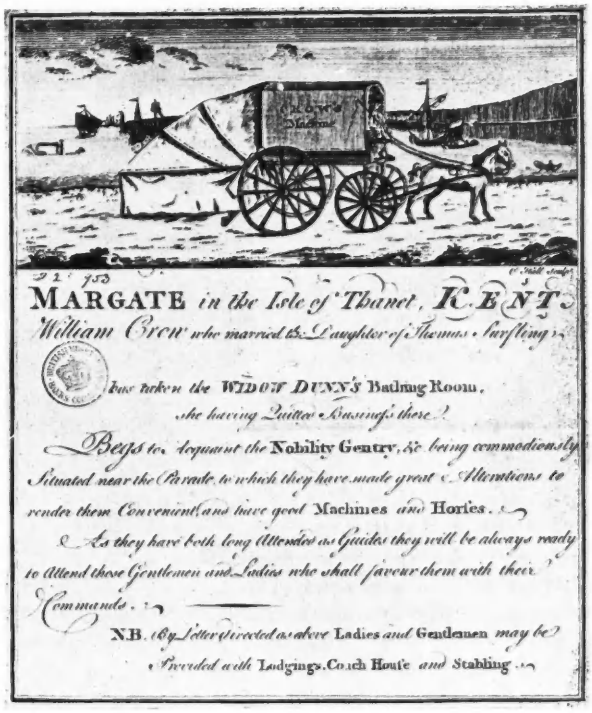
*The pamphlet had appeared earlier but was now for the first time advertised in this way, as it still had topical interest.

had now replaced the Tudor word "siquis," and Nedham's paper advised the public of theological treatises, of lost and stolen horses, or of such new beverages as "the drink called *Coffee*, a very wholesome and physical Drink; helpeth Digestion, quickeneth the Spirits, maketh the Heart lightsome, is good against Eyesores, Coughs, Colds, Rhumes, Consumption, Gout, Dropsy, Scurvy, and many Others." Another Protectorate newspaper advertised, in 1658, "that excellent, by all Physitians approved, *China* Drink, called by the *Chineans*, *Tcha*, by other Nations *Tay*, *alias* Tee."

A Royal Advertisement

After the Restoration, the word, "advertisement," originally used for book notices only, gradually replaced the older "advice" and "siquis." It was now, too, in May, 1660, that another enterprising journalist, Oliver Williams, started setting up "certain Tables in the Cities of London and Westminster" for the benefit of those publishing "any of their Arts, Misteries, or Businesses," thus evolving a fixed station for the advertisement, something not unlike the modern poster hoarding. And royalty itself smiled on the new art, when King Charles II, in June, 1660, advertised in *Mercurius Publicus* for a missing dog of doubtful breed, "between a Greyhound and a Spaniell"; doubtless stolen, as His Majesty ironically explains, "for the Dog was not born nor bred in England, and would never forsake his Master." Only in the direction of newspaper advertising was there a set-back. The government, jealous of the rapidly developing Press, muzzled the newspaper by the severe Printing Act of 1662, and the result was that poster advertising had the field, as in Tudor days, practically to itself. Indeed, from 1662, until the final lapsing of the Printing Act in 1695, was the Golden Age of the little early poster. These were extensively displayed, not only on posts and walls as of old, but on Oliver Williams's new Tables, and at the Coffee Houses. Long before the days of Anne, with which we usually associate it, the Coffee House had become the general club and meeting-place of the business world; and all the Coffee Houses had their walls hung with gilt frames containing advertisements. Framed advertisements and posters on the wainscot were also to be found all round the walks of the second Royal Exchange, which, since the Great Fire of 1666, had replaced old St. Paul's as a resort for trade and gossip. And nothing could be more interesting than the late 17th century posters, representing practically every trade, which exist in public and private collections. Their type and layout are usually poor; but their vivid phraseology, their quaint woodcut illustrations (now in general use for the first time), and above all their surprising grasp of what we should to-day describe as advertising psychology, make them well worthy of study.

By the end of the 17th century, however, newspaper advertising was gradually recovering. The Printing Act was laxly administered, and advertising organs, such as *The City Mercury*, of 1675, or John Houghton's *Collection for the Improvement of Husbandry and Trade*, of 1692, managed to appear; while the idea of co-operative advertising seems to have been behind the various advertisement-filled papers distributed at this time "Gratis, in The Cities of London and Westminster." When, therefore, in 1695, the Printing Act lapsed and the Press was free at last, newspaper advertising was for the first time able to compete on equal terms with the long-established little poster. In 1710, indeed, advertising was already such a finished art in England that Addison devoted a number of *The Tatler* to a delightful article on the whole subject. "Its main use," said he, "is to inform the world where it may be furnished with almost everything necessary for life"; and he thus anticipated by some 200 years the stock advertising phrase of modern America, "Tell the world!"


MARGATE in the Isle of Thanet, KENT
William Crow who married the Daughter of Thomas Darfling
has taken the WIDOW DUNN'S Bathing Room,
she having Quitted Business there
Begs to acquaint the Nobility Gentry, &c. being commodiously
Situated near the Parade to which they have made great Alterations to
render them Convenient, and have good Machines and Horses.
As they have both long Attended as Guides they will be always ready
to Attend those Gentlemen and Ladies who shall favour them with their
Commands.
N.B. By Letter directed as above Ladies and Gentlemen may be
Provided with Lodgings, Couch House and Stabling

Bathing-machine proprietor's trade card, c.1780.

Certainly, we may regard this witty article of 1710 as another important milestone in advertising history. After it, development is both more rapid, and along wider lines. Poster and newspaper advertising flourish side by side, and the English public itself grows far more advertisement-conscious than it had hitherto been. Indeed, the 18th century "personal" advertisement, dealing with such "wants" as wives, lost umbrellas, or menservants "of black complexion and sound principles," forms a fascinating sideline to the story of advertising in this period.

By far the most important 18th century development, however, was that of the artistic advertisement. It was now that what is generally known as the tradesman's card first appeared. This was originally a large visiting card, giving the tradesman's address and a reproduction of his sign. But it soon developed into what its own period called, not a "tradesman's card," but a "shopkeeper's bill"; and its most usual dimensions were from 7 inches by 10 to 15 by 22, roughly those of the conventional 17th cent. "bill," not of a visiting-card at all. In this form it was hand-distributed and displayed on posts and walls, or, more often, within the small panes of glass (generally also measuring about 15 inches by 24) of the contemporary shop-window.

Dorothy Mercier
Printseller, and Stationer,
at the Golden Ball,
London.
Sells all Sorts of Italian, French, and Flemish Prints
Buys & Sells all manner of Old Prints
Likewise Frames Prints in the Neatest & Genteelest Taste
Where may be had all Sorts of Papers for Drawing &c.
The best Black Lead Pencils, Black, Red & White Chalk
Variety of Water Colours, and Camels Hair Pencils
The best Dutch Sealing Wax
Sells Flower Pieces in Water Colours, Painted by her self, from the Life
And Frames for Ladies in a New & Elegant Manner

An engraved trade card of c. 1730, designed by Gravelot and etched by Chatelain.

Wonderful examples of 18th century tradesman's cards can be seen in the Banks Collection (British Museum), the Douce Collection (Bodleian), and at the London Museum. Many are also reproduced in Sir Ambrose Heal's charming book on the subject. Practically all are line- or stipple-engraved, many by such masters as Chatelain, Hogarth, and Bartolozzi, either from their own designs or from those of Gravelot, Paul Sandby, Benjamin West, and other artists. No advertisements of any period have more grace and charm: their dainty illustrations, their effective layout, and their flowing lettering, make them almost perfect examples of the advertiser's art. To the student of social history, too, they are interesting, providing a running commentary on the life of the day such as can be found in no other records.

Side by side with this most important evolution of the artistic advertisement, in the form of the tradesman's card, ran the steady growth of newspaper advertising, already noted, and many interesting collateral developments. The newspaper advertisement was now also illustrated by spirited little woodcuts, either of the tradesman's sign or of the goods for sale. The sandwich-board appeared, for the first time as a single board at the end of a pole, with a notice pasted on it, and was well established by the 1750's. Party politics adopted the poster idea, as is illustrated by the wonderful Westminster Election posters at the Guildhall Library, or the Burke posters at Bristol. Verse advertising developed along humorous lines. And both literature and art, in the 18th century, used the familiar advertisement to point a moral or adorn a tale; witness Doctor Johnson, Sheridan and Hogarth.

An extraordinary setback in advertising, and more especially in artistic advertising, occurred, however, in the early years of the 19th century. The era of the Coffee House, where once the little gilt-framed poster had found so fit a home, was over. Gone, too, was the great age of English line-engraving, although the engraved advertisement was still to be found in the better monthly magazines of the period. Newspaper advertising was dropping the vivid wood-cuts of an earlier date, and relying entirely on crowded letterpress of lamentable layout. And, for a while, only the amusement poster—for the theatres, or for Vauxhall and Astley's—

and the political poster seemed to be keeping the advertising idea alive at all. The political posters of the great Reform Bill struggle, of 1831-1832, for example, are far more effective and well-designed than the contemporary business advertisement of almost any type. Until, by early Victorian days, the illustrated advertisement, whether it is studied on the poster hoarding or in the smug magazines of the period, seems to have sunk to its lowest depths. The stultifying effects of self-satisfaction and aggressive respectability in the middle 19th century are as traceable on this minor, though by now ancient, art, as on those of far greater importance.

It was not until 1871, when Fred Walker's famous poster for "The Woman in White," at the Olympic Theatre, appeared, that a great artistic renaissance, both in the field of the poster and in that of artistic advertising generally, began. The original of this finely handled design is in the Tate Gallery. From its appearance, which marks yet another notable date in advertising history, there has been a consistent advance along, for the most part, splendid lines. The purchase by Messrs. Pears of Millais's *Bubbles* in 1888, further stimulated this forward movement in artistic work, which reached perhaps its peak height in the memorable poster output of the 'nineties. With those spacious days, illumined by the work of Steinlen, Chéret, and Toulouse-Lautrec in France, and of Dudley Hardy, Aubrey Beardsley, and the Beggarstaff Brothers in England, an article on early English advertising must not concern itself. But side by side with their achievement ran an advance almost as notable in the artistic quality of the loose-leaf advertisements which filled the new popular magazines of the same period: and both together have pointed the way to the variety and effectiveness of English advertising of to-day.

Fred Walker's famous poster of 1871, *the first of a new era.*

After all, there is nothing new under the sun. Even that most modern of arts, the art of broadcasting, is only the ancient art of appeal through the ear—the art of the preaching friar and of the wandering minstrel—coming into its own again. So, behind modern advertising, too, there lies a historic past, and a tradition—a tradition that includes the fine and dignified lettering of Caxton, the humour and vigour of the 17th century poster, and the grace and imagination of the 18th century line engraving—of which it can at least be proud.

Books Received

(*Continued from page* 378).

The Clear Mirror. By G. E. Hutchinson. (Cambridge Univ Press. 8*s.* 6*d.*)

Voyages of a Modern Viking. By Helmar Hanssen. (Routledge. 10*s.* 6*d.*)

With Scott to the Pole. By Howard Marshall. (Country Life. 5*s*).

Cambodian Glory. By H. W. Ponder. (Thornton Butterworth, 15*s.*)

Scrambles amongst the Alps. By Edward Whymper. (Murray 10*s.* 6*d.*; new revised edition.)

Great Earthquakes. By C. Davison. (Murby. 17*s.* 6*d.*)

Weather Science for Everybody. By D. Brunt. (Watts. 2*s.* 6*d.*)

The Theory of Dimensions. By F. W. Lanchester. (Crosby Lockwood. 12*s.* 6*d.*)

Accidents and their Prevention. By H. M. Vernon. (Cambridge Univ. Press. 15*s.*)

The Nation's Intelligence. By J. L. Gray. (Watts. 2*s.* 6*d.*)

Surprise and the Psychoanalyst. By T. Reik. (Kegan Paul. 12*s.* 6*d.*)

An Examination of Logical Positivism. By J. R. Weinberg. (Kegan Paul. 12*s.* 6*d.*)

Science in Daily Life. By G. H. Trafton and V. C. Smith. (Lippincott. 8*s.* 6*d.*)

Everyday Science. By A. W. Haslett. (Bell. 7*s.* 6*d.*)

The World of Science. By F. Sherwood Taylor. (Heinemann. 8*s.* 6*d.*)

The March of Knowledge.

Migrations to America

Dr. Aleš Hrdlička's excavations on the Aleutian Isles, in the course of which the abnormally large skull was found (see DISCOVERY, Nov. 1936, p. 351), were undertaken with the object of obtaining evidence that these islands served the Eskimo and Indians in their migration from Asia to America as a later and alternative route to the more northerly passage by Bering Strait and the Alaskan coast, where Dr. Hrdlička has been engaged in investigation through a succession of summer seasons over a number of years. His conjecture that the later migrations made use of the more southerly route has been fully borne out by discoveries of the past season.

Aleut Mummies

Although the islands are now only thinly populated, the remains of many villages, some of considerable size, have been discovered. Weapons, household utensils, stone lamps, plates, amulets and skeletons have been collected. A Unique feature of this prehistoric Aleutian culture is the occurrence of mummies. Desiccated bodies were found, which had been wrapped in hides with inner wrappings of furs or grass mats, and then stored in tiers in almost inaccessible caves, where they had been preserved for centuries. The method of preparation is elaborate and highly specialised, and thus argues a long period of development, presumably in Asia. The argument for the use of the Aleutian Islands as an alternative route is strengthened by the discovery of cultural links with Kodiak Island off the coast of Alaska on the northern route.

Sounding for Fish

The electrical echo-sounder is to be used for the detection of shoals of fish. Experiments with the instrument have been undertaken by Scottish West Coast fishermen in Loch Fyne while they were engaged in ring-netting herring. Some of the motor skiffs were fitted out with the necessary apparatus, and direcly they came in contact with a shoal of " invisible " herring the echogram or recorded echo gave evidence of their presence ; nets were let overboard, and the course of operations of encircling the herring and leading them into the bags of the nets resulted in good catches being landed and marketed. The echometer was originally intended to be used for recording the depth of water, the nature of the sea-bottom, whether smooth or rough, over which a vessel passed, and also any obstruction, either fixed or moving, that was located in the intermediate water layers. It was found, however, that as certain fish contain in their bodies a quantity of air this was sufficient to react to the electrical charge sent out, and enable a record or echogram to be made.

Coloured Aluminium

A new industry is being established in Birmingham for working a process by means of which aluminium can be dyed in permanent colours. Although aluminium has been coloured previously, the process to be carried on in Birmingham is new, and was perfected by a young Surrey chemist, and a company has been formed to commercialise the new method. The process is electrical, and gives a protective covering to the aluminium which becomes an integral part of the metal, and is not in the form of a deposit, as in chromium plating. Aluminium treated by this process becomes insulated against electrical current up to 500 volts, and it will not corrode.

New Star

The Nova in Sagittarius discovered on October 6, is the third to be detected since June. It was announced by the International Astronomical Union's Bureau at Copenhagen, and its magnitude was 6 at midnight on Oct. 5/6. The discoverer is Mr. C. Jackson, of the Union Observatory, Johannesburg, who less than a month ago discovered a faint comet. Owing to its southern declination of $-34°$, it will not be possible to observe the nova from the latitude of Greenwich, and further news of its behaviour must be awaited from southern observatories.

Hope for " Bleeders "

The discovery of a preparation from egg-white, which reduces the clotting time of blood, provides new hope for hæmophiliacs. While no claim is made of a cure for "bleeding," the usefulness of this preparation in controlling hæmorrhage seems beyond doubt. Dr. W. A. Timperley, who was jointly responsible for this disdiscovery, described in the *Lancet* how he found that if egg-white was incubated at $37°$ C. for several days in the presence of potassium bromide, it was possible to extract from the mixture a substance whose addition to blood *in vitro* under certain conditions led to the formation of a clear, structureless gel which did not shrink like the ordinary blood-clot. Patients treated by injection had already shown marked improvement.

Where Discoverers Were Wrong

By Professor D. F. Fraser-Harris.

The psychology of the scientific mind is a strange one, and the light of science casts shadows as well as providing illumination. It is perhaps not always realised how often the great pioneers of learning clung to some outworn belief, and many of Dr. Fraser-Harris's instances will come as a surprise—and perhaps as a warning.

It is not always necessary to have correct notions about the elements of a science in order to make valuable discoveries in it. Again and again in the history of the advancement of knowledge we have cases of men who did excellent work and yet held antiquated views about the very foundations of the sciences they were doing a great deal to extend. In some cases these workers made discoveries of cardinal importance, yet failed to grasp their significance, which had to be left to others to announce.

Thus Friar Bacon, who certainly understood the optical properties of convex lenses and spherical mirrors and who according to accepted tradition knew of the composition of gunpowder, was nevertheless a firm believer in astrology. "Bacon was skilled in Astronomy," says Mr. Ivor Hart in his *Makers of Science*, "though he followed the universal rule of his day which regarded the movements of the stars as affecting the lives of men. He was, in fact, a believer in Astrology and he even held that the origins of religions depended upon the conjunction of the planets. Yet in spite of the fact that we now know Astrology to be nonsense, the superiority of Bacon as an astronomer over his contemporaries is indisputable."

"Old Moore" Astronomer.

Exactly the same is true of Kepler; Kepler, whose Laws of Motion constitute the magnificent foundations of modern astronomy, not only believed in astrology but published a book on how to "tell fortunes" by it. The very man who had proved that the squares of the times of revolution of the planets round the sun were proportional to the cubes of their mean distances from the sun also actually believed that the movements of the same heavenly bodies, which he himself had shown to be characterised by an astonishing degree of exactitude, nevertheless influenced the destinies of creatures living on one of these planets 93 millions of miles away from the sun.

Mr. Hart's version of it is this, ". . . . he published a sort of Old Moore's Almanac and told people's fortunes, and generally practised the acts of the astrologer in a way which in these days would have earned for him a prosecution, at any rate in England."

Francis Bacon is generally supposed to have been one of the most enlightened men of his time and an enthusiastic exponent of the scientific method. Yet according to Dr. Draper, Bacon "contemptuously rejected the Copernican system alleging absurd objections to it." As a matter of fact Bacon appears to have been ignorant of mathematics and its application to the problems of physical science. These defects, however, by no means impaired the power of his intellect. Contrary to what is usually thought, Bacon was more of a moral philosopher than a "natural" philosopher, as the student of physical science used to be called. Doubtless Bacon's ignorance of mathematics rendered him unable to appreciate the proofs on which the Copernican theory rests, for these are almost entirely mathematical.

Ptolemy's Mistake.

For the matter of that Ptolemy himself is another example of our thesis that one's work may be good even although one's basic concepts are faulty. His observations on the movements of the heavenly bodies were remarkably accurate, yet as everyone knows his system of a fixed earth with the sun, moon, and stars revolving round it was entirely wrong, elaborate enough as it was with its cycles and epicycles galore. Thus though Ptolemy's astronomical system *appeared* to explain the movements of the sun and stars, later astronomical research showed that not only was it unnecessarily complicated but that in fact it was not the true "theory" of the heavens. The planets move in ellipses, not in circles as Ptolemy had imagined; and the sun is not at the centre of any circle but at one of the foci of an ellipse.

We now come to Joseph Priestley, the English discoverer of oxygen—for that all-important gas had three discoverers, Scheele in Sweden, Lavoisier in France, and Priestley in England. Priestley's work on a number of gases is classical for he was an excellent experimenter and his discoveries helped to lay the foundations of chemistry as we know it to-day. Priestley's isolating of oxygen as "dephlogisticated air" by concentrating the sun's rays through a convex lens on to a quantity of red oxide of mercury inside a flask is well known, and is the incident represented by the fine statue to him at Birmingham.

Nevertheless in chemical theory Priestley was completely wrong, for he believed to the last in that Teutonic will-o'-the-wisp, phlogiston, a non-existent sub-

stance which was *supposed* to leave bodies in the process of their burning. It was thought to depart from bodies when they were burned, whereby they were supposed to become lighter. But when weighings were carried out it was found they did not become lighter, and that this phlogiston could give no trustworthy evidence of its existence anywhere at any stage of a chemical process. Priestley's clinging to the discredited phlogiston theory did not impair his powers of observation or mar his success in discovery, but it shows how a man can hold a completely erroneous theory and yet do the most excellent pioneer work in his science.

Oxygen "Producer of Acidity"

From Priestley we pass to Lavoisier, who undoubtedly did learn from the English chemist some facts of cardinal importance regarding oxygen, an element which at that date (1774) was still unnamed. For Lavoisier not only isolated oxygen but showed it to be essential to what has since been called "oxidation," that heat-producing process that goes on both in the non-living and in the living realms. Lavoisier's work was of the first order of magnitude and yet when he came to name the newly discovered gas (hitherto known as "dephlogisticated air") he gave it the name "oxygène" based on a mistaken notion about one of its properties, as the producer of acidity or sourness.

Now oxygen is not by any means a constituent of all acids as this name, the acid-producer, would imply: some acids, of course, contain oxygen but there are many which contain none, the familiar hydrochloric acid being an example. Once again, quite erroneous views in chemistry did not detract from the pre-eminent worth of Lavoisier's discoveries. They were fundamental both for inorganic and for biological chemistry and Lavoisier, who gave the death-blow to phlogiston, is rightly regarded as the Father of Modern Chemistry.

Contemporary with Priestley was Sir John Pringle, M.D., F.R.S., the leading physician of his day. He was a Scotsman who had built up a large London practice after having been Physician-in-Chief to the army in the Netherlands. He was present at Dettingen in his official medical capacity, sharing the same carriage with the Commander-in-Chief, the Earl of Stair, and he was at the battle of Culloden as physician to the Duke of Cumberland. Pringle is rightly regarded as the Father of Military Hygiene, and his book, *Diseases of the Army* (1752), has long been a classic. In the Appendix to this work Pringle described a long series of experiments conducted into what he called "septic and antiseptic substances" by which he referred to chemicals which were thought to induce putrefaction in the living body and those which restrain or prevent putrefaction whether in the body or out of the body.

In the sense in which Pringle meant it there are no chemicals which are "septics," for we now know that putrefaction (sepsis) is a fermentation arising from the growth in dead tissue or in organic material of living microbes discernible only by the microscope. Pringle, however, began these researches by assuming, as was universally believed in his day, that there were chemical septics, but much of his own work disproved this very thing. Thus once more an entirely wrong theory did not incapacitate a serious worker from being a pioneer, in this case in the investigation of a very large number of substances thought to be antiseptics. Pringle was President of the Royal Society from 1772 to 1778, and although already a Baronet of Nova Scotia was created a Baronet of the United Kingdom by King George II in 1766.

Sir John Leslie, Professor of Natural Philosophy or, as we now call it, Physics at Edinburgh University, made discoveries regarding heat which are considered as of the highest importance. In particular he was the first physicist to produce cold artificially by the process of evaporation. Leslie is the father of all such as handle refrigerators and cold-storage plants. He froze water in the partial vacuum of a bell-jar, the moisture in the air of which was continously taken up by sulphuric acid.

Objective Reality of Cold

Leslie had already demonstrated convincingly that a black or dark-coloured substance absorbed much more heat than a white or pale one. In spite of these discoveries in the science of heat, Leslie firmly believed in the objective reality of cold. No one to-day regards cold as having the same independent existence as heat. Heat is something which can at least be transferred from one body to another, from the coals in the fire to the water in the kettle, from the end of the poker in the fire to the end outside which we may unwittingly grasp and so be burned. Whereas "cold" is our name for that kind of sensation (usually unpleasant) which we experience when heat is taken out of our bodies at too rapid a rate.

Leslie's mental attitude towards some of the facts of physics and meteorology, such as those which underlie the theory of the formation of dew, is very difficult to reconcile with his undoubted ability as an observer and experimentalist. For in 1818, in a paper communicated to the Royal Society of Edinburgh, he rejected the correct explanation of the formation of dew that had been put forward by Dr. W. C. Wells, and substituted a purely hypothetical one of his own. Dew, said Leslie,

is the outcome of " a continual darting of cold pulsations by day and night from an azure sky." Wells had conclusively shown that the chilling of surfaces on which dew was deposited was the consequence of these surfaces having radiated away their heat into the air—a process which went on much better when the sky was clear than when clouds prevented this more or less rapid radiation. Leslie, curiously enough, opposed this reasonable view, clinging, as his biographer says, " with curious tenacity to his theory that cold had an objective existence distinct from heat...."

Leslie would seem to have kept the problem of the formation of dew in a logic-proof mental compartment, a process by no means unique among even very eminent men of science in all ages. For instance, Sir Isaac Newton himself indulged in fanciful explanations about the interpretation of that extremely obscure work the *Book of Revelation*.

The subject-tight compartment mind is much commoner than one would suppose. In point of fact it comes to this, that it is possible to be a good observer without being a great thinker. This is illustrated in the case of the celebrated French anatomist, Baron Cuvier. Of his pre-eminence in anatomy and comparative anatomy there is not a shadow of doubt, and that he was one of the founders of palæontology is equally certain, but he failed to see the implications of his own discoveries. He insisted that we should study the fossil and extinct animals alongside the extant forms and note in any one type the far greater number of resemblances than differences. But having done this with all the required wealth of detail, Cuvier did not draw the conclusion so obvious to us now that these two animals have had a common origin. Similarity of structure did not mean for Cuvier the legacy of features derived from a common ancestry which seems to us the only possible explanation.

An Unprogressive Mind.

He was in fact an opponent of the doctrine of organic evolution in general and of the views of Lamarck in particular. Cuvier had a vast but unprogressive mind. He was not a philosophical anatomist; he explained the presence of different types of fossils in the successive strata of the Earth's crust by supposing that successive cataclysms almost " cleared the stage," as the late J. Arthur Thomson put it, and that a remnant escaping destruction secured continuity for the next series of living forms.

Baron Cuvier died full of honours in 1832 having enriched biology with an enormous number of new facts about life in previous ages but without helping to inaugurate the new era in zoology in which Darwin was not only to accumulate facts but offer an explanation of their meaning. Cuvier did much but he never rationalised palæontology.

Very much the same sort of thing is exemplified in the life of the geologist, Sir Charles Lyell—the great apostle of Uniformitarianism as opposed to the theory of successive catastrophes having been responsible for the different series of the fossils discovered in the successive strata of the earth's crust. In his *Principles of Geology* (1830) " Lyell," says Professor Bury, " undermined the assumption of catastrophes by showing that the earth's history could be explained by the ordinary processes which were still in operation, yet held fast to successive acts of creation." Less than a hundred years before, Buffon in France had been forced to state that he believed implicitly in the biblical account of Creation.

Where Logic Fails.

It is regrettable but true that the greatest minds have had what we must call lacunæ where logic failed them; the daylight of science does not apparently illuminate everything, here and there it throws shadows where doubt lingers. The most fair-minded and candid men of science have their pet aversions, their foibles, their weaknesses, and, it must be confessed, their pettinesses.

There is an infirmity even of the noblest minds in the realm of science. As life advances, there is a progressive decline in mental elasticity, an increasing desire to be undisturbed in one's life-long beliefs—in a word, a mental inertia. Very few minds are exempt from the operation of this tendency: to be young in mind though old in body is extremely rare; the names of men exhibiting this combination could be counted on the fingers of one hand. Such an attitude, however, is absolutely necessary to the mental equipment of the complete scientist, if there is or ever will be such a person!

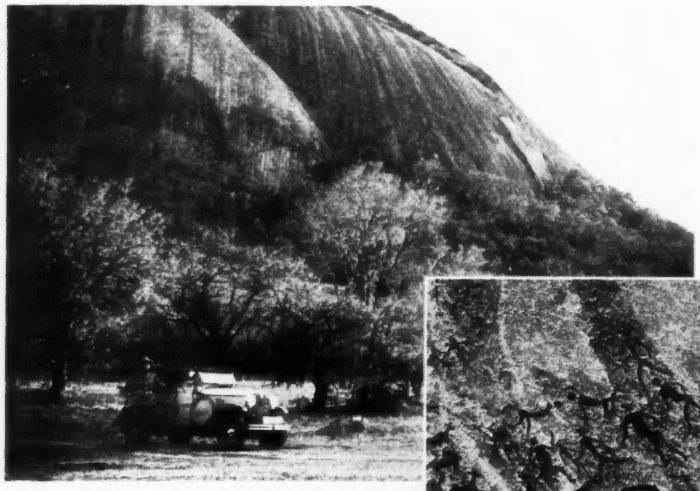
But indeed theoretical correctness is no necessary pre-requisite for the achievement of valuable practical results. Thus, many a " quack " doctor, whose knowledge of physiology and pathology is negligible, has been able to effect cures which have been the envy of the " regular " men. Nay, more, a duly qualified medical man himself may hold some entirely erroneous or antiquated view, say in biochemistry, and yet be able to carry out a wholly successful line of treatment. Some successful medical men believe that the theoretical basis of homœopathy is a delusion, and yet homœopathic practitioners have many cures to their credit.

Knowledge is always power but, for all that, power may be present without any knowledge whatsoever.

Bushman Cave-Paintings

About 60 miles north of Salisbury, North Rhodesia, in the neighbourhood of the small settlement of Mtoko, is an interesting cave halfway up a steep conical mountain, accessible only after a way has been forced over boulders and through thorny scrub. At first sight the grey walls of the cave, which is about 210 feet long, reveal nothing extraordinary, and visitors who failed to bring water with them will be disappointed, for except the faint outlines of some men and animals they will not discover the mural paintings for which this place is renowned. The trouble of carrying a bucketful of water up the hill, however, makes the enterprise worth while. For if the walls are beaten with a wetted cloth, red-coloured paintings of primitive hunters and all kinds of game will appear suddenly and almost magically. It is believed that these drawings were made about 2,000 years ago, by a race which must have been far more advanced than the Bushmen of to-day. Generations of these early cave dwellers had obviously been engaged in adorning the walls of their homes with mural paintings, as almost everywhere slightly differently tinted layers of paintings are superimposed.

The animals are sketched in with a very fair adherence to anatomical truth, and as many of them are unknown to us, it is to be presumed that they are now extinct. We cannot but reflect on the abundance of game that must have inhabited this territory, which to-day has been hunted almost empty; and on the fate of the race that produced such fine paintings and knew of colours which we are now unable to produce.



[*Photographs by Lieberen*

Above: The conical mountain, typical of Northern Rhodesia, on which the cave with the paintings was discovered.

Right: A group of the lively sketches of hunters and game, showing several layers of painting superimposed.

Egyptian Prize Essay.

A prize of £50 is offered for an essay in English on some archæological or ethnographical (not mainly linguistic or literary) subject connected with prehistoric or Pharaonic Egypt. The essay should show original research. The words "archæological" and "ethnographical" are to be interpreted in the widest sense. The subject may be selected by the candidate himself, and the essay should be illustrated by as much comparative matter as possible from other lands, whether ancient or modern. The utmost use should be made of photographs and drawings. The prize will be awarded only if the work is of sufficiently high standard to warrant it. Mr. K. de B. Codrington, Dr. Margaret A. Murray, and Mr. G. A. Wainwright have kindly consented to act as adjudicators, and their names are a sufficient guarantee that competitors' work will be expertly and impartially judged.

The candidate may be of either sex and of any age. The essays should bear their title, and should be accompanied by a covering letter. Only the covering letter, *not the essay*, should be signed. Essays must be typed, and must be sent in before December 31st, 1937, to Mr. J. H. Hay, Solicitor, 29, Bedford Square, London, W.C.1, who will give each essay a number and forward it to the adjudicators. Other correspondence should be addressed to Mr. G. A. Wainwright, 26, Elm Park Gardens, London, S.W.10.

Book Reviews.

The Crisis of Civilisation

Ideology and Utopia. By KARL MANNHEIM. (Kegan Paul. 15*s*.)

This is one of the three or four most important books on the crisis of Western civilisation yet published. Unlike the authors who have made a good thing out of world cracking in its joints by telling people what they want to hear and fixing the blame respectively on the Fascists, Communists, Liberals, armament mongers, pacifists, Catholics, Jews, and so forth; and unlike those more serious but no less shallow quasi-thinkers *á la* H. G. Wells, who seek the remedy of our troubles in a more vigorous application of the theories and practices which precipitated them, Dr. Mannheim goes to the root of the situation by diagnosing it as a *crisis of knowledge*, by tracing the disintegration of our institutional fabric, the distrust of ameliorative measures, and the sense of impending disaster, to the growing realisation that *all* our theories have deceived us, that our ideas have no " reality-covering," that we are in the grip of a " false consciousness."

He submits that at any time the existing social structure, *i.e.*, the already found solutions of human problems, or " the facts " on the one hand, and, on the other, the proposals to amend these facts and to solve the new problems emerging from them, form an indissoluble manifoldly interpenetrating unity of situation, knowledge and action; and that within this unity not only our account of the world but also our method of drawing up that account, not only our thought-contents but also our thinking technique or " conceptual apparatus," is determined by the given but ever-fluctuating adjustment of group-interests; by the desire of those who have found a degree of satisfied security to preserve the status quo, and the desire of the dissatisfied and insecure to change it.

A Fictional World

These opposed group-interests tend to veil from us " the world as it really is " by forming, on the one hand, ideologies, or complexes of justificatory fictions whereby the securely established groups seek to persuade their opponents and themselves that all is well, and, on the other hand, utopias, or pictures of the world as it should be, used as offensive weapons by the discontented groups bent on transforming society. As long as the contending groups only accuse their opponents of ideological thinking, that is, of an interest-dictated falsification of reality, the programmes and beliefs of each group, based on the conviction that it at least knows what the world " really " is like, retain a dynamic quality which impels to useful action.

But once we begin to suspect that our own world-picture, too, is ideological, a deadlock is bound to result; we begin to fear, not that we shall lose what we have or fail to get what we want, but that what we have is not worth defending and what we want is not worth striving for. Such a deadlock exists in the Western world to-day; and it can only be broken by a complete revision of all our knowledge by means of an analysis of its social determinants, by a systematic uncovering of the ways in which what we want shapes what we know, and the consequent clarification of what we should want. This revision and clarification is the function of the sociology of knowledge, a new discipline originated by the late Max Scheler and developed and introduced to the English-speaking world by Dr. Mannheim's magnificent book.

Where Dr. Mannheim succeeds as no one has succeeded before him is in presenting a structural analysis of our situation. Where he fails is in grasping the *meaning* of this situation. And he fails because he does not raise the ultimate point at issue: he does not question that conception of human destiny which, after having commanded the all but undivided assent of Europeans for four centuries, has now at last become questionable. Because he does not see that the liquidation of this last certitude is at the bottom of all our problems, he stays stuck in that epistemology of a pragmatic empiricism which is the mind's method of constructing a world in which this particular conception of human destiny becomes realisable, an epistemology common to all modern groups whose attitudes he analyses. Others—Berdyaev and Maritain above all—have grasped this meaning without being able to work out a structural analysis of the dialectic in which Western civilisation now has attained to the negation of the thesis posited by Renaissance and Reformation. The final account of the " end of our time " still remains to be written.

EUGENE BAGGER.

Rutley's Elements of Mineralogy (23rd Edition). By H. H. READ. (Murby, 8*s*.)

This is the fifth edition of this useful work published under the editorship of Professor Read. As an introduction to mineralogy it continues to be particularly suitable for the student of geology and mining. Compared with the 22nd edition, published in 1929, the number of pages has been increased by over one hundred, and the text has been completely revised and reset. Much new matter has been added, and the illustrations are also new and more numerous.

The Nature of the Physical World. By Sir Arthur Eddington. (Everyman's Library, No. 922. 2s.)

The publishers have put us under a debt to them by producing a cheap edition of this classic work, first published in 1928. It is the outcome of the Gifford Lectures, delivered in the University of Edinburgh in 1927. It came at a time when much nonsense was popularly believed about relativity, and helped to put an end to a great deal of woolly thinking about it. It contains a popular account of relativity and the quantum theory, and the implications of these in our view of the universe. It is, however, much more than this—the beauty of much of the writing, and the wit with which so many of the difficult passages are spiced, raises the book far above the level of the popular scientific treatise. " In the world of physics we watch a shadowgraph performance of the drama of familiar life. The shadow of my elbow rests on the shadow table as the shadow ink flows over the shadow paper. It is all symbolic, and as a symbol the physicist leaves it. Then comes the alchemist mind that transmutes the symbols. The sparsely spread nuclei of electric force become a tangible solid ; their restless agitation becomes the warmth of summer ; the octave of æthereal vibrations becomes a gorgeous rainbow. Nor does the alchemy stop here. In the transmuted world new significances arise which are scarcely to be traced in the world of symbols ; so that it becomes a world of beauty and purpose—and, alas, suffering and evil." Compare the views of last century on the nature of the physical world with present-day ones concerning atomic structure, as put by Sir Arthur : " Something constructed of levers, geared wheels, squirts, or other appliances familiar to an engineer " and " something unknown is doing we don't know what." It would be untrue to say that all the philosophical implications have been accepted calmly by " professional " philosophers, but of this matter the present reviewer is not competent to judge. All well-read persons have necessarily read this book, unless expense prevented them from doing so. Now Messrs. Dent have removed this barrier.

A. C. Menzies.

Olympia. By Walter Hege and Gerhardt Rodenwaldt. (Sidgwick & Jackson. 21s.)

The 94 quarto plates and 32 half-tone illustrations in the text of this book give us at last as complete a photographic account of the sanctuary of Olympia and the sculptures found in it as could conceivably be desired. The rapid advances of modern photographic methods have now made it easier to photograph those very elusive and (from the photographer's point of view) ill-exhibited sculptures from the temple of Zeus, which must rank as the greatest achievement of the architectural sculptor in Greece. The innumerable attempts to photograph the head of the Apollo have all failed up till now. Here, on plates 43-48, the reader will find that chief masterpiece of extant Greek sculpture of the 5th century, accurately and exquisitely portrayed. The head itself evidently fell from the body and was protected from weathering at a date long antecedent to that when the body finally fell to the ground. We have in this head a work of pure, unblemished marble, almost in mint condition. Now it can be properly studied by those who have not seen the original. The photographs reveal the extreme subtlety of modelling of the mouth and facial surfaces round it, and also of the eyes ; but they also show how any tendency to refinement of detail was rigidly subordinated by the artist to his main structural conception of the head as a whole. For at Olympia the sculptor is throughout thinking of the architecture he is adorning ; a disciplined outlook forgotten a generation later.

The text is adequate and to the point, giving all essential facts, but avoiding controversial matter. The author accepts without discussion the 4th-century date of the Hermes.

The book comes at a time when it was badly needed. As photography has advanced, so it has become essential for the major sculptures of Greece to be presented accurately and with scholarly appreciation to students. The old-fashioned " professional " photograph issued by firms who sent photographers who were neither artists nor scholars to do their work, has long been a serious impediment to proper study. Students of Greek art must use photographs prepared by students, for no mechanism can lie so effectively as the camera. The text is well translated by Mr. Roger Hinks.

S. Casson

Television Optics. By L. M. Myers. (Pitman. 30s.)

It may easily be said that this is the best book on an aspect of television that has appeared from an English pen. It is expensive, as text-books go, but from the scientific information contained and the routes to more detailed information, one feels that it offers good value. The author has a subtle style in expounding what are, from the practical engineering point of view, difficult scientific conceptions. The path of television has been a long one, although it is not much more than ten years since Baird made a system which worked, however crudely. Much money has been spent and wasted, for the problem is technically very difficult. When it is solved and the public are given a programme, not a few people suggest that it will inherently fail. Meanwhile, the scientists have to make the system work, and the present author shows how the field has been narrowed down. The treatment is mainly mathematical, with practical applications, so that the general reader may well find himself lost, while the technician enjoys himself. The formation of images is treated at some length, with the many defects which can arise in lenses and be cured with sufficient knowledge, since this is basic to the use of the Kerr cell and, by analogy, in the electron lenses which have proved the missing link in making a modern television system function at all. Such detail as is not immediately required is referred to in a large bibliography. The public for such a specialist text may be small, but the publishers may be congratulated in issuing it, since it shows that this country is not lagging behind in an application of science where other countries appeared to have forged ahead.

L. E. C. Hughes.

A Mathematician Explains. By Mayme Logsdon (Cambridge University Press. 7s.)

There can be no doubt that the fuller realisation of the idea and the concrete reality of humanity is the greatest need of the time, enforced on us just now by so many hideous violations of the simplest dictates suggested by the idea. To gain this end we must approach the rise of humanity historically, and the growth of an accurate-thinking mind is the clearest path. This is why the inclusion of science in its due, central position in general history is so important, and mathematics is the solid kernel of science.

There have been, of course, many admirable histories of mathematics, and one (Danzig's charming book on " Number ")

sketch of the evolution of the general ideas. But we cannot remember any attempt to present the various operations and branches of mathematics pedagogically and historically at the same time before this quite moderate-sized volume by an assistant professor in Chicago. It is, therefore, a notable effort and is bound to be followed by others of the same kind. At the same time as a pioneering work it is obviously open to criticism, which honest pioneers will always take in good part.

The chief criticism here is that the two objects tend to obstruct one another and neither gets satisfactorily done. The book is in parts very interesting but it cannot be said to carry out its title. "The mathematician" does not properly "*explain*." The historical notes are a useful feature—especially the parallel with the growth of the child—but they are incomplete, and sometimes rather forcibly dragged in; and the mathematical sections, especially that on the calculus, are too elaborate for the general purpose of the volume. The work, in fact, needs "integration," and it might be very difficult, if not impossible, to do it clearly and adequately in this scope.

However, a very sensible article by Professor Gilbert Bliss on the relation between mathematical theories and the facts of nature is included, and some skittish, though not very illuminating, drawings of pondering Hindus and puzzled physicists. The root idea of the book is excellent.

F. S. Marvin.

Unknown Karakoram. By R. C. F. Schomberg. (Hopkinson. 15*s*.)

The Mir of Hunza once said in open Durbar: "Why do old men like Schomberg wander about like this? What use can they be? It would be better if they died." Which was rude of him. But Colonel Schomberg's wanderings have provided material for several books, of which this latest is an admirable example. Wandering in the Karakoram mountains is not a picnic nor, even if its many discomforts are annoying rather than dangerous, does it give the thrills offered by more beautiful regions such as the Himalaya. Colonel Schomberg himself asks whether it is worth the trouble entailed. "It is well to be candid," he says, "and I often wondered as we toiled along the shale slopes and paddled through the strenuous icy burns, with our view frustrated on all sides by the stark black mountains imprisoning the stone-filled valleys, whether the Karakoram was worth troubling about; and whether this inhuman mass of sour, lifeless mountain and ravine was not meant to be denied to mankind. And then suddenly the sun would shine, the view unfold, and we would not exchange our lot for any other!"

The Karakoram "is eminently one of those places through which one passes hastily and nervously," but it has been little explored and the author had the satisfaction of finding new routes and solutions for some of the problems concerning old ones which have baffled the few previous white travellers. There the traveller has to play a long game of Tom Tiddler's Ground between the snow and the rivers. The latter may be low enough to cross in the morning but have swollen to impassable dimensions and speed by mid-day. They change their bed frequently and delight in crossing a wide valley so that for a few yards they may lick the foot of a perpendicular cliff and force the traveller to make an arduous detour.

Food supplies are a difficult matter and the Shingshali porters must be the most exasperating that ever troubled an explorer. To few peoples can any kind of exertion be less attractive even when they are anxious to make money. They lied and swindled from the day their employment began in their endeavour to bring the expedition to an early conclusion.

Most of his readers will surely agree with Colonel Schomberg's plea that peaks should be given names rather than the lifeless numerals which are favoured by the Royal Geographical Society. Foreign travellers give names to peaks and unless steps are taken, "travellers in the mapped but unnamed valleys of the British Empire will find themselves crossing the Hitler Pass, descending the Goering glacier and admiring Mount Mussolini." As for the Mir of Hunza, he would not choose this book as his monument. But for us it is an interesting entertainment as well as useful addition to the literature of Central Asia.

The Modern Dowser. By Vicomte Henri de France. (Bell. 4*s*. 6*d*.)

The author of this small volume on dowsing for water, minerals and other objects—or divining, as it was formerly and, we believe, more correctly termed—is well known through his writings and his journal, *La Chronique des Sourciers*, to students of the subject. Like his compatriot, Dr. J. Regnault, the Vicomte is a strong upholder of what is known as radiesthesia, or radiation perception, in connection with the diviner's art; it being assumed, on this hypothesis, that every object, whether animal, vegetable, or mineral, is either surrounded by some kind of magnetic field of force or else emanates radiations of a kind and frequency specific to its proper nature—possibly electro-magnetic rays. Such a conception, originating in the dowser's very real subjective sensations and muscular automatisms in the vicinity of various hidden objects of search, has led, recently, to the attempted elaboration of a detailed science of dowsing, founded upon a physical basis. Thus, radiesthesists have not hesitated to borrow, often irrationally and incautiously, from the terminology of physics; drawing, moreover, many unwarrantable analogies to electromagnetic phenomena, and making bold assertions as to the kind and origin of various, as yet hypothetical, emanations, which more critical investigators have hitherto failed to record on the most delicate physical instruments.

Considerable impetus has been given to these speculations by recent experiments with photographic plates over radioactive soils, by the invention and achievements of wireless telegraphy, and so on. Without wishing, however, entirely to deny the possibility of such radiations or fields of force, the physicist and psychologist alike are justified in requiring a more strictly scientific and unprejudiced examination of the phenomena in question than they commonly receive at the hands of the average practising diviner. Indeed, it yet remains for a book to be written on the experimental side dealing comprehensively with the matter from the physical and psychological standpoints.

The Vicomte de France cites various simple experiments with rod and pendulum, which, he claims, substantiate the radiation theory; and it is true that, with sufficient practice (or is it auto-suggestion, aided by more or less of some clairvoyant faculty in almost all of us?), the majority of persons can repeat at least some of the effects in question—usually with ill-befitting subjective variations. But it is equally true that precisely similar effects are demonstrated by "psychic" subjects, such as clairvoyants, psychometrists, and mediums. Indeed, the author himself is now forced to admit that many, if not all, of the dowser's results can be obtained by a purely intuitive method in which spatio-material conditions are evidently transcended; though that admission is ingeniously camouflaged by the name

tele-radiesthesia. Again, it is not admitted that there is a tiresome disagreement between the subjective codes and methods of individual dowsers, and that most good diviners—those competent at specific diagnosis—tend to be of a "psychic" disposition, markedly open to auto-suggestion and mental dissociation. Similar criticisms may almost certainly be made of the, often highly successful, medical diagnoses of the "electronist" school of the late Dr. A. Abrams, briefly mentioned in the present book.

Space does not permit of a detailed discussion of the numerous procedures and experiments described by M. de France, but it should be stated that repetition of the former and of others like them, by the present writer, employing fresh and unbiassed subjects, has shown many such effects to be due to auto-suggestion, on the one hand, and (where successful) to a clairvoyant faculty, on the other. Certain passages in the book (*e.g.*, p. 125, para. 3) are not at all clear, and many of the author's explanations (*e.g.*, as to depthing by a copper wire or by counting, on pp. 46-48) are not likely to prove acceptable to the experienced physicist or psychologist. Otherwise, the book is clearly written and well printed, and should be useful to the would-be dowser and of interest to the parapsychologist. On p. 121, the Abbé Carrié is stated to have "fastened to his rod a sort of picture provided with a pointer." This appears to refer to Carrié's hygroscopic dial, described by H. Mager in his more comprehensive work, *Water Diviners and their Methods*.

J. C. Maby.

Food and the Family Budget. (The Engineers' Study Group on Economics. 3*s*. cloth, 1*s*. 6*d*. paper.)

The Engineers' Study Group has set out to determine whether the known possibilities of potential plenty are realisable in this country within a measurable number of years and what steps are to be taken to ensure that a specified increase in the average or minimum standard of living is attained. The report indicates the derivation of an average family budget which ensures reasonable comfort without luxury and amounts to a basic expenditure of £313 per annum, of which £95 goes in food. The latter section of the budget is dealt with in detail, the questions of housing and fuel and light forming the subjects of future reports. The latter half of the report contains information and criticisms by eminent authorities, such as Sir John Orr, and Mr. Colin Clark, who has calculated the percentage increases in the various commodities required above that now consumed.

The members of the Group are to be commended for utilising their special type of mental training in studying the requirements of the people; doubtless they are not satisfied that the economists proper are doing their best in guiding social policy. Economics is a unique science in that its exponents are at variance on fundamentals; perhaps engineers can see the outstanding problems more clearly and offer a technical solution, unbiassed by political leanings.

L. E. C. Hughes.

Portugal: a Book of Folk Ways. By Rodney Gallop. (Cambridge University Press. 15*s*.)

In these days, when so much uninformed political twaddle is being written about Portugal, a book like Mr. Gallop's comes as an oasis in the desert. The author, one feels, really knows his subject. The keynote of the work is to be found in the dedication: "to the many Portuguese in every province and every walk of life whose unfailing courtesy and kindness have helped me write this book."

The book, as the author says in his preface, aims at reviewing the rich folk-heritage of Portugal, a task that has yet to be undertaken in full detail. He apologises, quite unnecessarily, for only skimming over the subject of the decorative arts; this can be dealt with in his next work. Actually, the first section of the book is an excellent brief guide to the most interesting features of the land and "sets the stage for the folk-activities with which the remainder is concerned." On this stage we see, in coloured pageantry, the Portuguese folk-singers, folk-players, and folk-dancers go through their traditional performances with a complete lack of self consciousness. How vital still are the customs of the old days may be inferred from the remark of the caddie on the sophisticated golf-course of Estoril, recorded on p. 108.

Calendar customs, marriage customs, and the like are described in full detail, and animated by photographs and by the expressive thumbnail sketches of Marjorie Gallop. The music of Portuguese folk-song and dance are faithfully recorded, together with the words of traditional ballads and popular quatrains. The last is a mode of expression still very much alive: witness the rhyme about the engine-driver at Vila Velha. A chapter is devoted to the vexed question of the *fado*, that remarkable modern product of Portuguese popular genius, which sprang from the plebeian quarters of the Alfama and Mouraria in Lisbon, and yet, in a variant form, finds exponents among the romantic students of Coimbra and among the artistes of fashionable night-clubs. It is, as Mr. Gallop suggests, probably a hybrid European-American production, the Portuguese equivalent of the jazz-croon, derived from the Brazilian jungle and the Lisbon slums instead of from the crowded streets of Harlem and the ghettos of Eastern Europe.

With a Spade on Stane Street. By S. E. Winbolt. (Methuen. 10*s*. 6*d*.)

Stane Street has had considerable attention in literature, perhaps more than any single example of our English Roman roads. The cardinal point of Mr. Winbolt's title, however, is the word *spade*. So far as present-day conditions allow, he and his helpers have sought, in the ground itself, concrete evidence of the lay-out of this homeland thoroughfare, and the result is a priceless manual of field archæology, which has great practical value apart altogether from the new facts which have been gleaned concerning this particular roadway. It is a model record of hard and continuous work and of the essential importance of not jumping at conclusions (*cf.* the discovery of how the Romans took their road across the brook at Oakwood Hill). It is good news to learn that since the publication of the book Mr. Winbolt, with the help of that other indefatigable worker, Mr. I. D. Margary, has found by trenching the line of Stane Street between Mickleham and Ewell, a triumphant vindication of his theory of its course in that section; and the whole length of the road from Chichester to the southern outskirts of London can now be regarded as completely proved.

One thing that helped Mr. Winbolt in tracing the dubious portions of route was that he disabused himself entirely of the theory that the road was made in the first instance for military purposes. This assumption has vitiated the guesses of previous

writers on the subject, and there is no evidence to warrant it, either historical (the local king, Cogidubnus, appears to have welcomed the Romans with open arms), or concrete, as scarcely any objects of a military nature have been discovered on or alongside Stane Street; it was, in fact, a purely commercial highway.

The right of way over greater portions of the Street has been allowed to lapse—usually where the more recent Saxon road turned aside to call at an inn—and in other places the track has become so overgrown as to be impassable. With a little goodwill on the part of landowners (which seems to be in evidence already) and energy on the part of local authorities, nine-tenths of the course of this Roman road could be opened as a public way for the greater enjoyment of the people of England and for a reminder of a great civilisation of the past.

The Red Centre. By H. H. FINLAYSON. (Angus and Robertson. 7*s.* 6*d.*)

This book has an unfortunate jacket. With its pictorial background and red disc it suggests luridness, whereas the contents are anything but lurid. In fact, lovers of adventure, attracted by the jacket, may be disappointed by the dry common sense of the first few chapters. Mr. Finlayson knows the centre of Australia too well. The 3-foot kooracardie lizard, the queer rabbit bandicoots, the kangaroo, the black man and the camel lines are all as familiar to him as a red 'bus to a Londoner. So he writes of them quietly, using few adjectives. The only chapter possessing real vitality is that in which he describes the capture for the first time since 1840 of *Caloprymnus* (a kangaroo-rabbit). This, for him, was the big thrill. Bouts with refractory camels, long treks between waters, and all the hardships of the "red centre," which would be stressed to great effect in many books are glossed over. This is probably the most unexciting, but most reliable and informative book on Central Australia at present existing.

Lasseter's Last Ride. By ION L. IDRIESS. (Jonathan Cape. 7*s.* 6*d.*)

Here is that rare thing, a book without a flaw. Produced with taste, well and clearly printed, it carries not a line of superfluous matter and contains not a single jarring phrase. It is the epic tale of L. H. B. Lasseter's search for a lost gold reef in Central Australia; of how an expedition equipped with a motor lorry, a car, and two planes, dwindled to two men on camels, to one man . . . to nothing. Though not a scientists' book, it will interest anthropologists and naturalists, for Mr. Idreiss himself spends some years wandering with an Australian aboriginal tribe, and he has conjured up a very clear picture from Lasseter's notes, dug up in old tins and bottles. The dirty, uncouth natives live for the reader; the feelings of the two lost flyers drinking rain wrung from a pair of shorts, eating fried tadpoles, ring true; the thoughts of Lasseter, dysentery-racked, maintaining a precarious ascendency over his Myall black captors by the "Kaditcha" evil spirit in his revolver, are tragically life-like. Truly, a fine book. One misses a few pictures, however: and why—oh, why—were we not allowed reproductions of the drawings Lasseter made in his pocket-book to hold the interest of the natives in the days immediately preceding his death.

The Paradise of Fools. By MICHAEL H. MASON. (Hodder & Stoughton. 15*s.*)

The Libyan Desert is yielding its mysteries one by one; but seldom have its secrets been more skilfully or sympathetically explored than by the expedition of W. B. Kennedy Shaw, which Michael Mason here recounts. The Ford car was the only thing to use, says the author, and over rocky scrub-desert and scimitar dunes, and even across the great Sand Sea, a small fleet of Ford cars carried these cheerful and daring travellers. Geography, archæology, and natural history are greatly the richer for their efforts, and the delightful thing about Mr. Mason's method of writing is that he almost persuades us we could (with a little practice) go and carry out a similar expedition ourselves. Slightly more careful reading—sometimes in between the lines—reveals that eternal vigilance on the leader's part and tireless co-operation on the part of the members of such an expedition are necessary; and we are left in amaze at the good spirits which animated the whole party in conditions of often ghastly discomfort. There is one unfailing blessing, however, about the desert: its immensity and its quietness induce in humans a profound sense of their own unimportance and provide them with a philosophy to face its terrors.

A worthy feature of Mr. Mason's writing should be placed on record, and that is the generous acknowledgement of the work of previous expeditions, without which such a trip as this could never have been undertaken.

Wilderness of Fools. By ROBERT CHURCHWARD. (Routledge. 10*s.* 6*d.*)

Every would-be explorer should read this account of an ill-fated and abortive expedition to Amazonia. The members of the party were temperamentally ill-assorted; the object of the expedition was in doubt from the first; and no results of importance were brought back. It is difficult to apportion the blame, as Mr. Churchward (who originally intended the trip to be little more than an adventure) is admirably impartial, with his rather pedestrian style. Perhaps the two chief villains of the piece are Colonel Fawcett and *The Times.*

Gari-Gari. By H. A. BERNATZIK. (Constable. 10*s.* 6*d.*)

Dr. Bernatzik gives us here a really convincing account of life and adventures among the tribes—many of them scarcely known to Europeans—who dwell between Nile and Congo, and in every way the volume is to be regarded as an advance on his previous work. While the technique of his photographs could hardly be improved, the selection of subjects in this case is distinctly better, and some of the portrait studies of native men and women are a delight to the eye. The author has undoubtedly the gift of winning the confidence of his African hosts, which is half the battle.

The population of the Upper Sudan is extraordinarily complex, and the Nilotic peoples have always offered an extremely interesting problem for the anthropologist. Dr. Bernatzik (aided by the very clear translation of Vivian Ogilvie) makes the tangled problem of the various tribes—Shilluk, Dinka, Nuer, Jur, and the rest—a great deal clearer to the uninitiated. Tales of hunting are here, too, in reasonable profusion, but there is not that insistence upon heads of game which mars so many African travel-books.

Short Notices.

The March of Chemistry (A. F. COLLINS; Lippincott, 12*s*. 6*d*.) is a queer mixture of the simple and the abstruse. It is essentially a study of recent developments in the field of chemistry, but also touches upon industrial processes and their sociological effect. It contains a number of fine photographs, and many less helpful drawings.

A Hundred Years of Medicine (WYNDHAM E. B. LLOYD; Duckworth, 15*s*.) is a further volume in the Hundred Years Series. It consists of an outline of the measures adopted during the last century in the fight against disease and is sufficiently non-technical to appeal to the layman.

Great Scientific Achievements (Professor A. M. Low; Nelson, 3*s*. 6*d*.) wanders over the whole field of science, selecting here and there an outstanding example for illustration and discussion. "We average," says the introduction, "a far better condition of knowledge than was true of the past, when those few of whom we have record did not compare well for accuracy with a modern child." This ungraceful sentence is a warning that the book adopts the "shown to the children" style, though it may appeal to those who can still find cause for pride in modern scientific achievements.

Indian Mosaic (MARK CHANNING; Harrap 8*s* 6*d*.), is a biography, pleasantly sparing with the first person, well leavened with conversation pieces. Those who like a seriously-written book with plenty of character-sketching will enjoy it, for though labelled "A Spiritual Pilgrimage" it portrays the life of the people of India as well as delving with understanding into their religions.

Suwarrow Gold (JAMES COWAN; Jonathan Cape, 7*s* 6*d*.), is a collection of short stories of the South Seas which suffers from the common fault of such works in tending to deify the men who sailed upon those seas, some of whom must have been very unpleasant and unpicturesque characters. Most of the stories, however, have a solid basis of fact, and some are very amusing. The tale of a boat carrying a cargo of bones which "came alive" in a calm, and had to be sunk to get rid of the vermin, is at any rate out of the ordinary.

Slavers of the South Seas (T. DUNBABIN; Angus & Robertson, 6*s*.) is a collection of exciting narratives concerning the South Sea "blackbirders," written in a pleasingly restrained style, with close attention to fact.

Why Aeroplanes Fly (ARTHUR ELTON and ROBERT FAIRTHORNE; Longmans, 2*s*. 6*d*.) is the first of the March of Time Series, edited by W. H. Auden and Arthur Elton, which are intended as an application of the principles of the documentary film to literature. It is lavishly illustrated, and will interest those with little knowledge of aeronautics. The initiated should avoid it.

Aquariums and Fish Ponds (A. LAURENCE WELLS; Warne, 1*s*. 6*d*.) is a very practical little treatise on how to build aquariums and fish ponds. Written in simple language, it can be followed quite easily, and one's interest grows as the tale of the hobby proceeds. To attain success with fish-keeping it is necessary to understand the habits of the particular kind of fish that will live in an aquarium or pond. When these facts have been mastered the enthusiast may look for some success with this hobby. The illustrations are extremely useful and practical, and the drawings of the aquatic plants at the end will be found very helpful for decorative purposes.

Television: Technical Terms (E. J. G. LEWIS; Sir Isaac Pitman, 5*s*.) proves that although a dictionary is no short cut to a working knowledge of a subject, a comprehensive list of definitions peculiar to a specialised field of applied science is of great use both to the student and to writers and workers who do not want to waste time in useless discussion. A new term or a new meaning to an old term means that someone has wanted to express a new idea, and the author has found abundance of these in the comparative new subject of television; he is to be congratulated in not letting the public wait a few years for an official glossary. Where desirable, outline drawings are given to make the definitions as clear as possible and some space is left for additions which the reader may come across in the future.

Inheritance and Evolution (W. F. WHEELER and E. B. FORD; Methuen, 3*s*.) provides a collection of material on these subjects sufficient for the Higher School, Intermediate Biological, or First Medical examinations. It contains 39 diagrams and a glossary.

Sketches from Nature in the North of Ireland (WINIFRED BROOKE; Carswell, Belfast, 7*s*. 6*d*.) is written for those with little scientific knowledge, but who are interested in the life and habits of plants and animals. It covers the whole field of nature, not omitting fossils, and contains over a thousand excellent drawings. The section dealing with insects is especially good.

Nutritional Factors in Disease (W. R. FEARON; Heinemann, 7*s*. 6*d*.) comprises the essay awarded the Buckston Browne prize for 1935 by the Harveian Society of London, with the references brought up to date, and an index and bibliography added.

Cosmic Rays Thus Far (H. B. LEMON; Heinemann, 7*s*. 6*d*.) is valuable in so far as any attempt to explain cosmic rays to the interested but non-technical public must be so, but the unnecessary spaciousness of the typography and the many skittish "lino-cut" illustrations vitiate Dr. Lemon's clear explanation.

Cosmic Rays (P. M. S. BLACKETT; Oxford University Press, 2*s*.) is a report of the Halley Lecture delivered in June this year, with four photographs.

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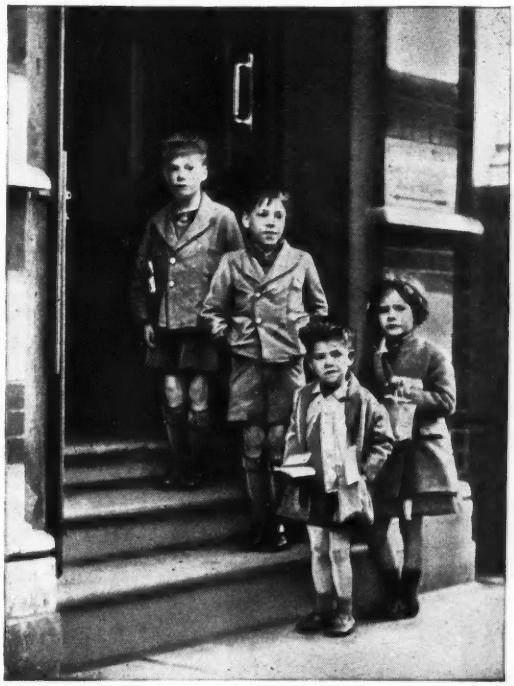

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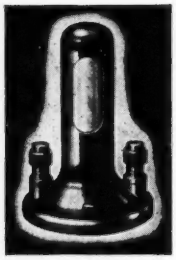

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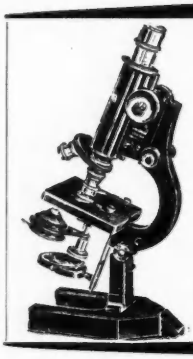

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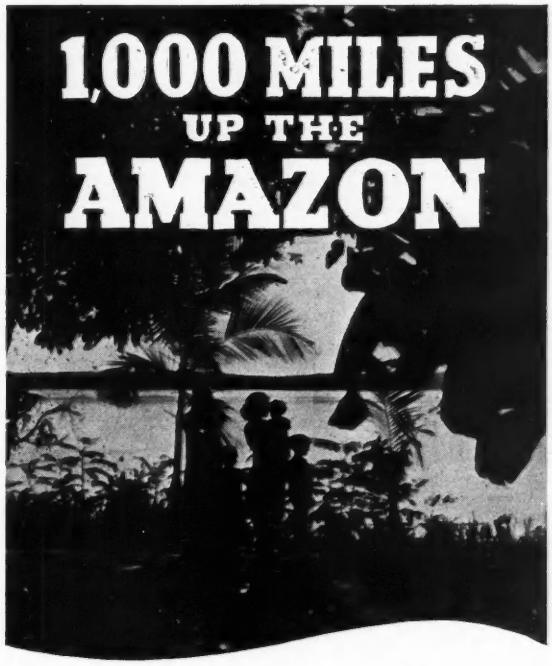

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